SECTION 5. BASIS OF DESIGN

5.1 PURPOSE: The A-E's Basis of Design is necessary to insure that projects are developed in conformance with established Navy/Air Force/Army criteria and that they are within authorized scope and funds.

The Basis of Design shall be a bound, indexed presentation of facts sufficiently complete that fully describe special requirements or situations affecting the work. It shall include the codes and criteria utilized and justification for any proposed departure from standard plans, specifications, NAVFACENGCOM technical publications, military handbooks, and design manuals or other criteria. The information to be addressed and included are described in the following paragraphs.

5.2 BASIC CRITERIA/CONSTRUCTION CRITERIA BASE (CCB): Technical direction and standards for design are contained in MIL-HDBK-1190, "Facility Planning and Design Guide" and in a series of NAVFACENGCOM design manuals and Military Handbooks. (See Appendix E for a listing.) A CD-ROM system published and distributed by the National Institute of Building Sciences (NIBS) to over 3,000 subscribers. CCB contains over a million pages of easily accessible and rapidly searchable documents and executable programs, provided directly to NIBS by over 120 participating federal agencies (Navy, Army, Air Force, etc.) and building industry trade associations, professional societies, standards-writing organizations and code bodies. Under a DOD site license of CCB, free copies are currently available for all DOD offices, including Navy and Marine Corps. Effective September 30, 2001 no-cost CCB Subscription will no longer be available for Contractor and A-E Firms. Annual renewals will be $700. CCB also includes SPECSINTACT, an automated specification processing system. (Refer to Appendix E - for additional information.)

5.2.1 Navy Criteria:

5.2.1.1 NAVFAC P-1010 Lessons Learned from Design and Engineering of Naval Facilities

5.2.1.2 NAVFACENGCOM Lessons Learned Program: Per NAVFAC ltr of 23 Aug 96, the NAVFAC Lessons Learned Program is being launched through the NAVFAC Home Page on the Internet:

At URL: http://www.navfac.navy.mil

5.2.1.3 PACNAVFACENGCOM Value Engineering Bulletin

5.2.1.4 Design Manual/Military Handbooks

5.2.1.5 Design Policy Letters (DPLs): Discontinued.

5.2.1.6 NAVFAC Criteria Interpretation and Waivers: If a waiver of technical design criteria appears justified and makes "good business

sense," it will be granted by NAVFAC 15C. However, if it is determined that the criteria is not correct or current, NAVFAC might change the criteria, not just give a waiver.

5.2.1.7 Action, Consultation and Engineering Response (ACER) Team Studies: Appropriate when project cost estimate varies significantly from the available budget, the project design appears inappropriate, there is a substantial bid bust or there is significant congressional interest in the project.

5.2.1.8 Value Engineering Database (VEDIS): This database is available at the website www.efdlant.navfac.navy.mil/criteria/tools/tools.htm. VEDIS has information on over 20,000 value engineering ideas proposed in previous value engineering studies. This information can be sorted by facility type, UNIFORMAT system, and several other criteria. Designers should review information in the data base as part of their pre-design information investigation.

5.2.2 Air Force (AF) Criteria: Air Force documents referenced in the "Scope" should take precedence over other DOD, Navy, federal, and industry documents referenced. Guidance contained in these AF documents should be used as the basis for design. Submit to the PDE, in writing, request for any deviation from AF criteria referenced in the "Scope".

5.2.2.1 Design for Maintainability. See Appendix F. Prepare cost evaluations of materials and systems so that durable, low-maintenance items are not replaced with high-maintenance items just to lower initial project costs.

5.2.2.2 Interior Design Presentation Format. Provides guidance in the implementation of Comprehensive Interior Design (CID) and Structural Design (SID) in Air Force construction projects. Reference Criteria: Hq AFCEE/CC of 26 Nov 96 (See Appendix F)

5.2.2.3 Revised Design Guidance for Projects Affecting PWC Pearl Electrical Utilities. Provides guidance for designs affecting (constructing, modifying, removing) electrical utilities under the ownership operation and/or maintenance of Navy Public Works Center, Pearl Harbor, Utilities Department. Contact PWC Code 620E at 474-2093 for information.

5.2.3 Army Corps of Engineers REMR Notebook. The REMR Notebook contains information that will be of use to personnel engaged in repair, evaluation, maintenance, and rehabilitation (REMR) activities at U.S. Army Corps of Engineers civil works projects. The information is presented in the form of REMR Technical Notes, each of which includes a statement of purpose, a point of contact for additional information or clarification, and other appropriate information such as when and where to apply the technology described, advantages and limitations of its use, costs and availability, and personnel requirements.

5.2.4 Availability of Criteria Documents:

5.2.4.1 Construction Criteria Base (CCB)/SPECSINTACT: A fully index data base, which contains a comprehensive engineering library on a compact disk (CD). See Appendix E for additional information.

5.2.4.2 Navy Documents: Design manuals, Military handbooks and other referenced manuals, instructions and materials published by NAVFACENGCOM are available on a loan basis by the PACNAVFACENGCOM Library. Standard references, textbooks, commercial and industry standards and similar material are not available for loan.

5.2.4.3 Other Agency Criteria: Army, Air Force, National Science Foundation and other agency criteria will be furnished as required.

5.3. APPROPRIATE ARCHITECTURE:

a. Result from the successful blending of four elements: respect of image (Navy characteristics), function, environment, and economy. Appropriate architecture does not let one of these elements dominate at the expense of the others, but places proper weight and emphasis on each element.

b. Be reflective and supportive of characteristics of the Navy's image. The Navy's image is timeless, dignified and serious, honest and rational, respectful, and a subservient part of the whole.

c. Be timeless. Architecture should be modern without going to extremes. Transient architectural styles such as "Post-Modernism" (facadism) or "High-Tech (strong expression of the mechanical ductwork) should be avoided. These styles are very short-lived and become obsolete and dated very quickly. Naval bases should not ride the roller coaster of quickly changing and short-lived architectural styles. Naval bases should not become architectural junk yards.

d. Be dignified and serious. Arbitrary, capricious, and frivolous architecture is not appropriate for the Navy. The use of multiple materials and forms just for the sake of decoration or style is not appropriate. Architecture for the Navy should be simple and straightforward, using compatible materials.

e. Be honest and rational and clearly represent the function it serves. Forms other than rectangular boxes are appropriate when those forms are honestly required for functional and/or economic reasons. The envelope of a building should not disguise the function of the building but should help to explain the function.

f. Be respectful and relate to its surroundings in terms, color, materials, detailing, and generic form(s). It should enhance the overall architecture of a base by honoring and preserving significant architectural, historical, local themes which bring consistency to a naval base.

g. Be subservient to the whole. No single building on a naval base should dominate architecturally, but each building should become an integral part of the whole base. No building should figuratively shout, "Look at Me". In most cases a definitive statement is not what is called for in integrating new facilities into a large complex of buildings constructed over many years.

h. Be economical and cost effective and should also appear to be economical and cost effective. Arbitrary and unexplainable uses of forms and materials may, in fact, not be costly, but there is a general perception that they are costly. This is not to say more durable materials should never be used, but when they are, they should be used for purposes of cost effectiveness, not decoration.

In summary, appropriate architecture for naval facilities respects and projects the image of the Navy, honestly reflects, the function of the facility, respects and enhances its immediate environment, and achieves its mission in a cost-effective manner.

5.4 BASE EXTERIOR ARCHITECTURE PLAN (BEAP): The BEAP generally provides guidelines for upgrading the overall appearance of Navy Shore facilities. BEAP Studies are generally separate from an Activity's master plan. The Facility Enhancement Plan (FEP) section of the master plan will contain specific site design guidelines. They address but are not limited to the following elements:

a. Architectural Style: Treatment for enhancement of existing structures through maintenance and repair (i.e., facade treatments; color coordination) and criteria for design of future new projects.

b. Landscaping: Plant palette, application, maintenance and schematic plans for typical developments.

c. Parking and Circulation: Layout, dimensions and typical finish/materials selection.

d. Outdoor Graphics: Graphic style, typography, sign face layouts, mountings and sign locations.

e. Lighting: Lighting standards and fixture styles.

f. Street Furnishings: Benches, bus shelters, bike racks, dumpster enclosures and service screening.

g. Area Cleanup: Clean/clear those areas for open storage and which degrade the quality of the immediate environment.

Incorporate the guidelines of the respective activity's BEAP or FEP as available into the project design. Specific BEAPs have been prepared for the following activities:

Pearl Harbor Naval Complex

Naval Air Station, Barbers Point
Naval Magazine, Lualualei
Naval Computer and Telecommunications Area Master Station, EASTPAC
Yokosuka Naval Complex, Japan

Prior to the initiation of the design, determine whether design guidelines have been developed by the Activity, even though a formal plan may not be on the foregoing listing, and incorporate these guidelines into the project design.

5.5 DESIGN COMPUTATIONS: Prepare accurate and legible computations for all phases of the design where necessary for the prosecution of the work on letter size paper. They shall be clearly detailed to permit review and to assure compliance with the best engineering practices.

5.6 DESIGN AREA TABULATION: The total project gross area and the breakdown of the gross area by functional use shall not exceed that identified on the DD Form 1391 or the "SCOPE." Provide in the Basis of Design a complete area breakdown tabulation for gross and net areas to confirm scope and criteria compliance. A supplemental drawing keyed to the area take-off and indicating method of take-off shall accompany the area tabulation. Subsequently revised areas will require area re-tabulation submittals at the 100% and final stages of project development. Refer to MIL-HDBK-1190, Facility Planning and Design Guide, for definitions of gross area and net area.

5.7 SITE PLANNING:

5.7.1 National Environmental Policy Act (NEPA) Documentation: The environmental effects of the proposed project on the human environment should be analyzed and documented per OPNAVINST 5090.1B CH-1. Ensure the appropriate level of NEPA documentation is consistent with the scope of work of the proposed project. The three possible levels of NEPA documentation are a Record of Categorical Exclusion (RCE), an Environmental Assessment (EA) or an Environmental Impact Statement (EIS).

5.7.2 Environmental Considerations: Explain the measures proposed for the preservation of trees, plants and wildlife, air, and water quality, pollution abatement, landscaping and the blending of construction with the surroundings. Perform a tree survey prior to design efforts and determine if existing trees and shrubs can be avoided. Thoroughly investigate and adhere to local environmental laws and permits. Pay particular attention to matters that are or could become controversial or is environmentally significant. A certified arborist or someone with comparable qualifications should be utilized to conduct a tree survey to identify exceptional trees.

5.7.3 Environmental Policies: Ensure compliance with the National Environmental Policy Act, PL 91-190 and the Clean Air and Water Pollution Control Act, Executive Order 11507, which requires that

Federal facilities meet the more stringent of applicable Federal, State and local air and water quality standards.

5.7.3.1 Installation Restoration (IR) Program and the Underground Storage Tank (UST) Program: Review the project site if the site has been addressed as part of the IR Program or the UST Program, and if either program has identified potential Hazardous Substances (HS) contamination at the site, review the schedule for site study and cleanup to ensure this schedule fits with the planned MCON action.

5.7.3.2 Hazardous Substance (HS): In compliance with the Preliminary Hazard Analysis (PHA) and the Occupational Health Act, PL 91-596 and reference criteria, if contamination by HS such as **PCB, tetrachloroethylene (perchloroethylene), asbestos, lead paint, silica sand**, etc. is discovered during project design/construction, specific legal/DOD requirements apply. If a threat to public health, welfare, or environment exists, immediate removal action must be taken to abate, minimize, stabilize, mitigate, or eliminate the HS release. If the hazardous contaminants exceed a legally set "reportable quantity," the Navy must inform EPA and conduct assessments and needed clean-up. **Coordinate review with the PDE who will contact the PACNAVFACENGCOM Environmental Division and the Safety/Occupational Health Manager to obtain the latest guidance/requirements on Government environmental regulations and design safety requirements**. Contact the Activity safety officer and conduct a visual site investigation for information regarding hazardous materials within the limits of the project. Design must safely control all identified hazards. OSHA and Life Safety Codes apply and waivers are not available.

5.7.3.3 Restrictions on Class I Ozone Depleting Substances (ODS): Under the Navy's ODS Advisory System, Advisory 96-01A provides additional ODS-related guidance. Comply with restrictions on Class I ozone depleting substances (ODS). A list of commonly used Class I ODS follows:

Common Name	Chemical Name
CFC-11	Trichlorofluoromethane
CFC-12	Dichlordifluoromethane
CFC-13	Chlortrifluoromethane
CFC-113	Trichlorotrifluoroethane
CFC-114	Dichlorotetrafluoroethane
CFC-115	Chloropentafluoroethane
R-500	CFC-12/HFC-152a Azeotrope
R502	HCFC-22/CFC-115 Azeotrope
R-503	HFC-23/CFC-13 Azeotrope
Methyl Chloroform	1,1,1-Trichloroethane
Halon 1211	Bromochlorodifluoromethane
Halon 1301	Bromotrifluoromethane
Halon 2402	Dibromotetrafluoroethane

Furnish a certification form when there are no Class I ODS in the contract. If the design requires Class I ODS, and no feasible

alternative can be found, provide technical justification in writing. (For a sample, see "Project Information Form for 100% and Final Submittals" at the end of Section 8.) Contact your PDE for further guidance on including Class I ODS substances in the contract.

Disposal of Ozone Depleting Substances (ODS). All contract specifications and contractual actions implemented shall be in full compliance with the referenced documents (a). Refrigerants and halons resulting from replacement and conversions of shore-based HVAC and refrigeration equipment and fire protection systems shall be recovered, recyled, and reclaimed and used exclusively in support of the Navy. The method by which monitoring of the Navy's reserve would be accomplished is outlined in reference (b). This supply can be managed at the activity level for local use or deposited in the Navy ODS reserve for mission critical applications in accordance with reference (c). POC: Felix Mestey, NAVFAC Code 41FM, (703) 325-8539.

Ref: (a) OPNAVINST 5090.1B and local implementing policy.
(b) NAVFACENGCOM ltr 5090 41FM/960137 of 21 May 96, Subj: Dept. of the Navy ODS Reserve Monitoring Plan
(c) NAVFACENGCOM ltr 5090 41FM/960136 of 21 May 96, Subj: Navy ODS Advisory System; enclosure (1) Navy ODS Advisory 96-01A

5.7.4 Notification of Demolition and Renovation: A Notification of Demolition and Renovation Form is required for all demolition involving "load-supporting" structures and/or asbestos work in the State of Hawaii. The designer should become familiar with the guidance/definition given to determine whether or not the Notification of Demolition and Renovation Form is required under the applicable regulations. The Contract should specifically state that the Contractor is responsible for completing all parts of the notification form that are required to be complete under the applicable regulations. Instructions for completing the form is included in NAVFAC Guide Specification UFGS-02220, "Site Demolition."

5.7.4.1 Submission of Form: Ten working days prior to commencement of work, complete and submit the Notification of Demolition and Renovation forms to Federal and State authorities and the Contracting Officer in accordance with 40 CFR 61-SUBPART M. Complete paragraphs I, II, III.B, III.C (if applicable), IX, and XVI of the form. Complete paragraphs I, II, III.B, III.C (if applicable), VIII, and IX through XIX of the form. Copy of form is attached at the end of this section. The designer shall complete paragraphs III.A, V, VI, VII, and ensure the quantity of asbestos indicated reflects what is shown on the drawings.

5.7.4.2 Definitions: "Demolition" means the wrecking or taking out of any "load-supporting structural member" of a facility together with any related handling operations or the intentional burning of any facility. "Renovation" means altering a facility or one or more facility components in any way, including the stripping or removal of RACM from a

facility component. "Regulated asbestos-containing material" (RACM) means (a) Friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations regulated by this subpart.

5.7.5 Historic Properties and Native Hawaiian Human Remains and Associated Cultural Material: Ensure compliance with the National Historic Preservation Act (NHPA), PL 89-665 as amended, and the Native American Graves Protection and Repatriation Act (NAGPRA), PL 101-601.

5.7.5.1 NHPA: NHPA requires that any Federal undertaking take into account the effects of that undertaking on historic properties. This may require the use of qualified professional archaeologists to conduct surface and subsurface survey in advance of design or construction, monitoring during construction, and emergency data recovery if significant historic resources are encountered during construction. In addition, any building or structure which is 50 years old (or less if associated with the Cold War or otherwise significant because of unique qualities) may be eligible for listing in the National Register of Historic Places. The A-E may be tasked to assist in the consultation process with the regulatory agencies, including the State Historic Preservation Officer and the Advisory Council on Historic Preservation.

5.7.5.2 NAGPRA: NAGPRA requires that certain procedures be followed when Native Hawaiian human remains, funerary objects, sacred objects, or objects of cultural patrimony (cultural items) are discovered or may be discovered on federal lands. NAGPRA applies to Native Hawaiian human remains and cultural items that are inadvertently discovered or intentionally excavated as part of a planned activity. If inadvertent discovery occurs in connection with an activity, such as a construction project, the activity in the area of the discovery must cease, and a reasonable effort must be made to protect the items discovered. The activity may resume 30 days after the agency receives notification that the appropriate Native Hawaiian organization(s) have been notified, or sooner upon a written binding agreement between the agency and Native Hawaiian organization(s).

5.8 SITING:

5.8.1 Physical Features: Describe man-made constraints, archaeological and historic considerations, topography, solar exposure, prevailing breezes, storm exposure, natural beauty of the site, prevalent noise, odors, dust and a description of nearby buildings at the existing site.

5.8.2 Orientation: Describe how the proposed design takes advantage of or is compatible with the physical features of the site; how it impacts on energy conservation measures; how the design minimizes existing hazards and nuisance effects; and, how the proposed structure(s)

harmonize or are compatible with the existing nearby buildings. Explain space, circulation, and functional plans for future expansion of the facility.

5.8.3 Circulation/Traffic Patterns: Describe pedestrian and vehicular traffic patterns as they relate to the adjacent building(s). Describe siting of utilities. Utilities should not detract from building appearance.

5.9 BUILDING DESIGN:

5.9.1 Type of Construction Adopted: Refer to the anticipated tenure of usage and the permanency of construction.

5.9.2 Previous Design Utilization: Maximize the use of definitives, standard designs and previous designs in lieu of preparing new, unique designs. Where the style, character, quality, and life cycle cost of previously constructed facilities meet the User Activities' needs, strongly consider site adaptation of those facilities; e.g., if a new BEQ is planned in the same vicinity as a BEQ constructed within the past 3 years that meets the User's needs, site adapt the previous design. Include a statement as to the consideration made of the use of definitives, standard designs and previous designs.

5.9.2.1 Site Adaptation of Standard or Working Drawings: On certain repetitive-type structures, such as BEQs, BOQs, subsistence buildings, and on certain technical structures, standard or working drawings will be furnished to the A-E for site adaptation. Site adaptation, in general, consists of modifying the structure to fit the site and making necessary mechanical and electrical changes (heating, evaporative cooling, or air conditioning) to fit the climatic conditions existing at the site. If other changes in standard plans or working drawings are contemplated, such changes will be spelled out in the "Scope." It is not the A-E's responsibility to review or check the design of the standard or working drawings furnished for site adaptation unless specifically spelled out in the "Scope." However, if errors in the drawings are discovered or if the design or functional layout appears unworkable on the site adaptation, the matter should be brought immediately to the attention of the PDE. If the A-E cannot fit necessary mechanical or electrical equipment into the space provided in the standard plan, then such space will be adjusted or increased as necessary for the equipment as part of site adaptation. In site adapting of another A-E's prototype design, the level of responsibility for the original design will be spelled out in the "Scope." Information available concerning known problems with the original design will be made available.

5.10 SUSTAINABILITY:

5.10.1 Sustainability: The concepts of sustainable development, when applied to facilities, offer solutions that address our environmental

concerns in the planning, design, construction and management of facilities.

NAVFAC's policies, procedures, procurement practices, criteria and standards are to fully implement sustainability concepts and will be the normal way we do business.

NAVFAC's policy is to incorporate sustainability principles and concepts in the design of all facilities and infrastructure projects to the fullest extent possible, consistent with budget constraints and customer requirements. Further, it is NAVFAC's policy to seek to do this with no increase in first cost. NAVFAC has adopted the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Rating System as a tool to apply sustainable principles and as a metric to measure the sustainability achieved through the planning, design and construction process. The A-E shall use an integrated project design approach that incorporates the sustainable design elements which will lead to improvements in life-cycle operations and reduction of life-cycle costs. Place highest priority on sustainable design features which will reduce energy consumption to the maximum extent feasible and economically justifiable while meeting the project and occupant requirements.

NAVFAC'S primary goals of sustainability include:

- Increased energy conservation and efficiency
- Increased use of renewable energy resources
- Reduction or elimination of toxic and harmful substances in facilities and their
- surrounding environments
- Improvements to interior and exterior environments leading to increased productivity and better health
- Efficiency in resource and materials utilization, especially water resources
- Selection of materials and products based on their life-cycle environmental impacts
- Increased use of materials and products with recycled content
- Recycling of construction waste and building materials after demolition
- Reduction in harmful waste products produced during construction
- Facility maintenance and operation practices that reduce or eliminate harmful effects on people and the natural environment
- Increased building and component durability and flexibility

Sustainable design concepts and principles can be applied to any type of facility, anywhere, and under any cost constraints. However, the extent to which specific sustainability strategies can be applied to a given project will vary, based on a wide array of local conditions, customer requirements, budget constraints, and other considerations.

Construction materials and methods should foster sustainability through resource conservation and recycling:

- Materials used for remodeling have a maximum or substantial recycled content, depending on availability
- Building materials are themselves recyclable
- Any virgin materials have renewable or sustainable sources
- Items removed from the building have been carefully limited
- Items which have been removed

Reference Criteria: "Whole Building Design Guide", Internet resource sponsored by Sustainable Building Industries Council, NAVFAC Criteria Office, Department of Energy FEMP, National Institute of Building Sciences, and U. S. General Services Administration located at web site: www.wbdg.org; "Sustainable Building Technical Manual – Green Building Design Construction and Operations" by Public Technology, Inc., 1996, available from web site: www.sustainable.doe.gov; "Greening Federal Facilities" by Greening America, 1997, available from web site: www.eren.doe.gov/femp; "A Guide to resource – Efficient Building in Hawaii" by Hawaii Advanced Building Technologies Training Program (HABiT) First Edition, Revision B, June 2000; "Hawaiian Design, Strategies for Energy Efficient Architecture: by Honolulu Chapter/The American Institute of Architects for the Department of Business, Economic Development & Tourism, Energy Division, State of Hawaii, 1990; NAVFAC "Planning and Design Policy Statements, 98-01, Design of Sustainable Facilities and infrastructure, 98-02, Criteria Supporting the design of Sustainable Facilities and infrastructure, 98-03 Procurement of Sustainable Facilities and Infrastructure Through Architect-Engineer (A-E) and Related Contracts, 98-04, NAVFAC Participation in the Affirmative Procurement of EPA Designated Products" available from the Construction Criteria Base (CCB); see Attachment A of Appendix Z for a list of additional references."

5.10.2 Sustainable Design Summary, Checklist and Case Study: Include a separate section in the project Basis of Design documentation for Sustainable Design. For all projects, provide a detailed discussion of sustainability principles and concepts that are incorporated in the design. In addition, include a summary of potential sustainable design ideas considered, but not implemented in the project due to budget constraints. Also, provide a completed U. S. Green Building Council's "Leadership in Energy and Environmental Design" (LEED) rating system checklist (latest version) for all projects. For each LEED sustainable design element that the project design meets, provide backup information and supporting calculations in accordance with the LEED Submittal Summary. Provide a statement signed by a registered professional engineer or architect certifying the LEED credits and backup information. The use of the LEED checklist should not be interpreted as a contractual requirement to design to LEED criteria or to obtain any particular LEED rating. However, the Navy endorses the principles of sustainable design contained in the LEED rating system and will utilize this system as a means of measuring the degree of implementation of sustainable principles. Information on the LEED rating system and checklist can be found at the U. S. Green Building Council's web site, www.usgbc.org. For all projects valued over $5 million, provide a Case

Study detailing the sustainable concepts of the project in a format similar to the example provided in Attachment B of Appendix Z in addition to the LEED checklist. Submit the LEED checklist with supporting information at the 100% (Pre-Final) Submittal, Final Submittal, and at the completion of construction to reflect any changes to the project during construction. Submit the Case Study at the completion of the construction following the commissioning. For all family housing projects, see NAVFACINST 11101.85H for additional Sustainable Development rating and reporting requirements.

5.10.3 Energy Conservation: The Navy must design and construct energy efficient facilities because the Energy Policy Act of 1992 and Executive Order 12902 require the Federal Government to reduce energy consumption (30 percent by 2005), while significantly increasing the use of solar and other renewable energy sources and designing and constructing new facilities to minimize the life cycle cost of the facility.

The Navy must change the way facilities are currently designed and constructed because new facilities must be designed to ensure maximum energy conservation, and integrated approach to designing Navy Facilities will minimize energy consumption, optimize life cycle cost effective renewable energy possibilities, and yield high quality durable facilities.

5.10.4 Energy Saving Features: Consider energy saving features in all phases of design. Consider energy savings techniques listed in Attachments A and B of Appendix M; “Hawaii Model Energy Code – Energy Efficiency Standard for Buildings” July 1993, Energy Division, Department of Business, Economic Development and tourism, State of Hawaii; and other creative, imaginative and innovative energy savings techniques. As a minimum, all projects must meet the energy conservation requirements of ASHRAE/IESNA Standard 90.1 of 1999 with approved addendums. See NAVFAC letter with Ser 11130 EICL/tjh dated May 29, 2002 regarding the Interim Technical Guidance “Energy Conservation Criteria Using ASHRAE Standard 90.1 of 1999 in Attachment D of Appendix M for future information.”

5.10.5 Techniques: Incorporate applicable techniques into the design where economically justified. Base the life cycle economic analysis on construction, maintenance and operation costs. Provide energy conservation design features where economically justified and within authorized funding limit. In instances where significant energy savings can be achieved but with a substantial increase in cost above the authorized funding limit, notify the PDE at the earliest possible time so that appropriate measures can be taken.

5.10.6 Energy Guidelines: Energy guidelines for Military Construction Programs may vary and therefore are not included in this publication. However, coordinate with the PDE to insure that current applicable energy guidelines for MCON projects are met. This includes requirements for (1) life cycle payback analyses of alternate energy systems and

solar energy, (2) computer energy analysis, and (3) energy conservation write-up in the FACD.

5.10.7 Computer Energy Analysis: A computer energy/system analysis will be accomplished in accordance with Attachment B of Appendix M for all new major buildings and building rehabilitation projects. Coordinate the requirement for energy analysis by computer with the PDE.

5.10.8 Solar Energy Study: Examine the project for solar energy application when applicable, and when called for in the "Scope" to prepare a solar energy study. The study is to determine the economic feasibility of applying a solar energy system to the project design. Design of solar energy system and supporting elements are considered critical because of the very limited temperature range, little allowance for heat leakage and the need for design optimization. Use the best engineering data and judgment to establish parameters for the solar energy system design consistent with the established criteria and engineering practices. Do not commence the design of the solar energy system until the solar energy systems study is evaluated and approved by PACNAVFACENGCOM.

5.10.9 Affirmative Procurement: The A-E shall comply with NAVFAC's Affirmative Procurement Program as detailed in the "Planning and Design Policy (PDP) Statement 98-04", dated October 12, 1998. The program promotes the purchase of products containing materials recovered from the solid waste stream. Prepare project specifications and other appropriate contract documents specifying the use of products that meet or exceed the EPA guideline standards for recovered content. Information regarding the EPA's Comprehensive Procurement Guidelines (CPG) and sources for the designated items containing recycled materials can be found at the EPA web site, www.epa.gov/cpg/. For CPG covered project materials included in the specifications, the A-E shall identify them in Item No. 5 of the PACNAVFACENGCOM "Project Information Form Required for 100% and Final Submittals". Specific circumstances may arise that preclude specifying products made with recovered materials. The acceptable reasons for waiver include:

1) The price of a given designate item made with recovered materials is unreasonably high;

2) There is inadequate competition (not enough sources of supply);

3) Unusual and unreasonable delays would result from obtaining the item; or

4) The recycled content item does not meet the agency's reasonable performance specifications.

If a waiver is to be pursued, the A-E shall provide a written request stating the materials and the justification for the waiver. The waiver request and approval shall be completed prior to the project design

final submittal. See Attachment C of Appendix Z for a sample waiver request.

5.10.10 Hawaiian Electric Company Inc.'s Energy Services: HECO's Energy Services Department has comprehensive consulting services available to assist designers in maximizing energy efficiency of our Oahu based project designs. Early in the design process for all Oahu based projects, the A-E should first review information regarding HECO's Energy Solutions at their web site www.heco.com. Then contact Hawaiian Electric Company, Inc., Energy Services Department to discuss the proposed project and obtain assistance in assessing the project to help improve the energy efficiency. For DOD and Federal accounts, the account manager and initial point of contact is Mr. Steve Luckett at telephone number (808)543-4646 or e-mail address at sluckett@hei.com. They have an "Energy Solutions for Business" rebate program that helps mitigate some of the up-front costs of qualified energy-efficient equipment. Presently, their rebate program applies to lighting, motors, air condition systems – packaged and split, air conditioning - chillers, and customized incentives that includes solar water heaters, heat pump water heaters, adjustable speed drives, process heat recovery, window tinting, and etc. For all qualifying items that are feasible to be incorporated in the project, the A-E will be responsible for completing the technical data portion of the HECO rebate application forms which will be submitted as part of the 100% and final submittals. For fully designed projects, the A-E shall include, if applicable, a paragraph in Specification Section 01110, Summary of Work, indicating the items included in the project documents that may qualify for HECO rebates such as:

> [1.10. The project includes requirements for [lighting, motors, packaged air condition systems, split air condition systems, air conditioning chillers, solar water heaters, heat pump water heaters, adjustable speed drives, process heat recovery, window tinting, or others] per Specification Section(s) [ ], Paragraph(s) [ ] which may qualify for Hawaiian Electric Company (HECO) energy rebates. The Contractor shall verify these rebates during the proposal preparation and incorporate the credit for the HECO rebates into the initial contract price. After the equipment/materials is installed and ready for use, the contractor shall prepare energy rebate forms, calculations, and other information for Government submittal to HECO. The Government will supply a letter to HECO authorizing direct payment of the rebate to the Contractor. HECO will not process the rebates until receipt of a complete application with all required information and their inspection of the equipment in operation.]

For design-build packages, the A-E shall either include a note to the Project Information Form Required for 100% and Final Submittals, Paragraph 8. Additional Information for Contract Specialist that the

Contract Specialist should include the following paragraph in Part 1, Acquisition Requirements, Section 1B, Proposal Preparation or include a similar paragraph in the Part 2, Technical Requirements under Section 2D Building Engineering, Material, Quality and Maintenance:

> [1B.X or 2D.X] Hawaiian Electric Company (HECO) Inc.'s Energy Services: Provide energy efficient equipment and materials that qualify for HECO energy rebates. HECO's Energy Services Department has comprehensive consulting services available to assist designers in maximizing energy efficiency. Information regarding HECO's Energy Solutions can be found at their web site www.heco.com. Further, the designers are encouraged to contact Hawaiian Electric Company, Inc., Energy Services Department to discuss the proposed project and obtain assistance in assessing the project to help improve the energy efficiency. For DOD and Federal accounts, the account manager and initial point of contact is Mr. Steve Luckett at telephone number (808)543-4646 or e-mail address at sluckett@hei.com. [Specifically, the Part 2, Technical Requirements Section, Paragraph(s) include(s) requirements for {lighting, motors, packaged air condition systems, split air condition systems, air conditioning chillers, solar water heaters, heat pump water heaters, adjustable speed drives, process heat recovery, window tinting, or others} which may qualify for Hawaiian Electric Company (HECO) energy rebates.] The Contractor shall verify these rebates during the proposal preparation and incorporate the credit for all applicable HECO rebates into the initial contract price. After the equipment/materials is installed and ready for use, the contractor shall prepare energy rebate forms, calculations, and other information for Government submittal to HECO. The Government will supply a letter to HECO authorizing direct payment of the rebate to the Contractor.

5.11 HEALTH AND SAFETY; HAZARDOUS MATERIALS (consolidated with 5.7.3.2 Hazardous Substance (HS).

5.12 DESIGN FOR THE PHYSICALLY HANDICAPPED:

5.12.1 Architectural Barriers Act. PL 90-480, passed by Congress in l968 and as amended by PL 94-54l, Title II, in l976 established that certain facilities financed with Federal funds be designed for the accessibility and use by the physically handicapped.

5.12.2 Randolph-Sheppard Act. Starting with the FY95 MILCON Program and the FY94 leasing actions, NAVFAC implemented this Act which calls for blind vending facilities in new, renovated, or leased facilities to be developed by the activity during the planning process. The host activity will be responsible for determining whether or not the state blind agency wants to establish such a facility in a qualifying project.

The Act does not apply to Navy exchanges or overseas facilities. All other projects will qualify if the following criteria is met:

a. New construction, MILCON or other project funding for a facility 15,000 SF or more or to be occupied by 100 civilian employees or more.

b. Alteration or renovation which substantially increased floor area or personnel capacity.

c. Facility leases of 15,000 SF or more or that will be occupied by 100 civilian employees or more.

5.13 FIRE PROTECTION: Fire protection design features shall be in accordance with MIL-HDBK-1190, Facility Planning and Design Guide, MIL-HDBK-1008C, Fire Protection For Facilities Engineering, Design, and construction (for Navy projects), AFR 88-15 Air Force Design Manual Criteria (for Air Force Projects), and National Fire Protection Association National Fire Codes. Also follow PACNAVFACENGCOM DPM408 Branch Policies, Attachment A of Appendix N. Use PACNAVFACENGCOM Specification Guideline Data, Attachment C of Appendix N, for additional information.

5.13.1 Hydrant Flow Test: Provide hydrant flow test data for applicable projects at 60% submittal. Attachment C of Appendix N contains method for conducting flow tests. (See p. VI-1.)

5.13.2 Hydraulic Calculations: Submit hydraulic calculations for projects requiring sprinkler protection at the 60% submittal stage.

5.14 ELEVATORS: If elevator maintenance service is required, check with the PDE if O&M funds will be used, requiring a separate bid price line item in the Project Information Form, attachment to Section 8, Specifications.

5.14.1 Design Requirements: Refer to NAVFAC Guide Specification UFGS-14210, "Electric Traction Elevators, UFGS-14240, "Hydraulic Elevators," and NAVFAC Design Manual DM-3.09, "Elevators, Escalators, Dumbwaiters." Also refer to the following at the end of this Section: Attachment (1), Basic Elevator Hoistway Dimensions for Design Purposes; Attachment (2), State of Hawaii Elevator Code Criteria Applicable to Navy Elevators in Hawaii; Attachment (3), Elevator Fire Protection Requirements; and Attachment (4) NAVFAC ITG 01-01, Interim Technical Guidance (ITG) “Elevator Design”.

5.14.2 Elevator Hoistways Fire Protection Requirements: Follow the fire protection design guidance stipulated in NAVFAC Design Policy Letter DPL-91-0003 (dated 17 Jul 1991) for automatic shutdown of the main power supply for elevators located in facilities equipped with automatic sprinkler protection. Refer to Attachment C of Appendix N.

5.15 WEIGHT HANDLING EQUIPMENT: The procurement of weight handling equipment of under 10 tons capacity, associated with a building, or other facility, not nuclear, hot metals, or special hazard use, is part of the A-E design responsibility. Unless otherwise directed by the "Scope", procurement of weight handling equipment 10 tons and higher capacity and specialized weight handling equipment (nuclear, hot metals, hazardous area, explosives, and precision handling) is the responsibility of the Northern Division, Naval Facilities Engineering Command (NORTHNAVFACENGCOM). For those cases where NORTHNAVFACENGCOM is the procurement agency, promptly supply the required operating data and pertinent field data for weight handling equipment to PACNAVFACENGCOM. An early submittal of this information is required for coordination and timely procurement and installation of the equipment. State the need for weight handling equipment and the understanding as to how the equipment is to be designed and procured. Discuss any special weight handling equipment requirements such as special slings requiring nonstandard hooks with the using activity. The A-E is responsible for understanding weight handling operations for the project to the extent that appropriate equipment, speeds, and controls are specified. Insure adequate clearance envelope and dimensions are indicated in the plans and specifications to assure no operational interference between WHE and building obstructions. Indicate where sway braces are required for monorails and crane rails. Show required details. See NAVFAC INSTRUCTION 11450.1 (latest revision) for detailed discussion of responsibilities concerning weight handling equipment.

5.16 CIVIL ENGINEERING:

5.16.1 Site Grading: Provide positive drainage away from structures and a positive differential between finish floor elevations and the finish grades adjacent to structures. Minimize earthwork wherever possible with design based on a reasonable balance of cut and fill quantities.

5.16.2 Storm Sewer System and Surface Drainage: Indicate the storm flow for the project and how it was derived. Indicate if the existing system to be connected to is adequate to handle the additional flow and how this was determined. At the l00% submittal provide calculations to verify the quantity of storm flow (use rational method) and the sizes, material, class and "D" load design of all storm sewers and culverts and sizes of drop inlets. Provide a small scale topographic map which depicts the individual drainage areas and their overland flow path.

5.16.3 Water Supply and Distribution:

a. Explanation of existing system, covering particularly the type, capacity, condition, present water use and unsatisfactory elements of component parts (for major extensions).

b. Statement of type of construction proposed, materials for water mains, type of well, etc.

c. For distribution systems, statement of design, domestic consumption required and available fire flow, residual pressure and elevation differentials. (Should include designer's basic estimate of tentative pipe sizes.) Indicate the water demand for the project and how it was derived. Indicate if the existing system to be connected to is adequate to supply this demand and how this was determined.

d. Statement of tentative sizes, elevations, capacities, or design consideration for reservoirs, treatment units, pumping plants, well pumps, pumps and how they were determined.

e. At the 60% submittal, provide calculations to verify the quantity of water required and the sizes, material and class of pipes, reservoirs and pumps. Also provide typical pump and system curves.

5.16.4 Sanitary Sewer and Sewage Treatment Systems:

a. Explanation of existing system covering particularly the type, capacity, condition, present flow and unsatisfactory elements of component parts for major extensions.

b. Interpretation of degree of treatment necessary by effluent requirement and units necessary for treatment.

c. Statement of design factors with present and design populations for various units of sewage treatment plants.

d. Statement of materials to be used for sewer systems and sewage treatment plants.

e. At the 60% submittal, provide calculations to verify the design flow and sizing of sewer lines and units.

f. A civil or sanitary engineer shall be responsible for the design of sewage treatment systems and plants.

5.16.5 Utility Piping Design: In designing connections to existing systems, the A-E may find that:

a. There are no as-built drawings.

b. Available as-built drawings do not depict the exact location of the pipe or the critical invert elevations.

c. Or, if depicted, the data may be incorrect based on his field observations.

If the above situations exist, proceed on the following basis:

a. If not included in the contract, request that a modification be issued to include the work required to uncover the critical parts of existing utilities, or

b. Ask the Station, through the PDE, to uncover those parts of the system in question so that his surveyor can obtain required data, or

c. Proceed on the best available data, then add the following note:

"Prior to start of excavation, the Contractor shall uncover the pipes to which connection is to be made, or the existing improvements which will be crossed by the new pipe, and determine their invert (or top) elevations to determine whether the new piping can be installed as shown, (add following for sewer piping) and when installed will work as intended. Any differences shall be brought to the attention of the Contracting Officer for direction on how to proceed." The A-E will then be requested to provide a solution if Post Construction Services have been awarded.

All contractors must be given the same basis for bidding. Thus the following types of notes are unacceptable.

a. "The Contractor shall visit the site to verify field conditions." (Note: Contractors cannot be required to make a site visit. The plans and specifications must contain all data required to allow a basis for bidding thats fair to all.)

b. "The location of existing utilities is unknown. The Contractor shall tone to determine whether there are any existing obstructions in the way of the new piping and shall relocate the piping to be free of these obstructions."

Acceptable note is as follows:

a. "Existing utilities or obstructions shown are based on the best available records (and/or topographic surveys as appropriate). However the Contractor shall tone the route of the new pipeline, from Sta. ___+__ to Sta. ___+___ to locate unknown underground construction. Should any be found that may interfere with the new construction, they shall be brought to the attention of the Contracting Officer."

5.16.6 Adequacy of Existing Utilities: Provide a statement whether the existing utilities are or are not adequate, and the basis of this statement. In many projects, the scope will not authorize a study of the adequacy of existing utilities. Therefore use the following sources for this information:

a. The A-E's fire flow tests if required by the scope. Most projects will require this.

b. Fire protection test records of utilities. Periodic tests of Station water supply lines are made and the PACNAVFACENGCOM Fire Protection Branch has these records.

c. The Public Works Office. Frequently, the person maintaining the as-built records of the Station's utility systems can tell whether your project can be supported by the existing utilities.

d. The A-E's observations of sewage flow in the manholes and the condition of the manhole. The high water mark can indicate whether there has been backup in the manhole. Also if there is a blockage in the sewer or otherwise improper flow conditions, septic sewage may result and be evident in the manhole.

e. As a last resort, the project documentation. PEDs will state that existing utilities are adequate to support the project. The A-E should be aware that while the statement may be true for the system, it may not mean that the closest point of connection has adequate capacity for the project.

If existing systems are inadequate to support the new construction, notify the PDE at the earliest possible time.

5.16.7 Dust and Erosion Control: Dust and erosion control, where deemed necessary, shall be considered an integral part of design and construction projects. Such control will be generally limited to areas actually scarred or denuded in the process of constructing a project. Dust and erosion control should not be confused with landscaping. If applicable, include a statement regarding the type of treatment selected, affected areas, and reasons for selection of type and determination of areas.

5.16.8 Fencing: Type, height and justification for fencing.

5.16.9 Roads and Parking Areas: Indicate the type, speed, volume of traffic, design wheel loads and how they were derived. At the 60% submittal, provide calculations to verify the thickness of pavements and base courses and horizontal curves, vertical curves, super-elevation and widening.

5.16.10 Airfield Pavements:

a. A brief outline of soil conditions together with an outline of the soils exploration and testing performed.

b. Wheel loading, types of aircraft, any abnormal operating conditions.

c. An explanation of deviations where made from Naval Air Systems Command planning standards and NAVFAC Design Manual DM-2l/MIL-HDBK-1021/_ series.

d. Design rainfall frequency and method proposed for storm.

e. A general statement regarding the type of lighting to be provided and the adequacy of existing runway and taxiway regulator capacities.

5.16.11 Disposal of Water Containing AAAF Fire Fighting Foam: Certain structures such as aircraft maintenance hangars must incorporate fire fighting equipment which uses AAAF foam. This foam must be handled in an appropriate manner.

The following PACNAVFACENGCOM consultants may be contacted for further advice on the subject.

a. Fire Protection Engineer, DPM408
b. Civil Branch, DPM405
c. Environmental Compliance Branch, Environmental Division, ENV181

5.17 LANDSCAPING AND IRRIGATION SYSTEMS:

5.17.1 Landscaping: Use landscaping to enhance and promote the integration of facilities with the surroundings. Low maintenance is of prime importance. Selection of plant materials native to the region is stressed. In the development of the landscape design, evaluate the possible utilization of plant materials to achieve functional area definition, privacy, screening, control of noise, sunlight, dust and erosion, modification of wind current and provision of shade.

5.17.1.1 Activity Master Plan for Landscaping: Ensure that proposed landscaping will be in general conformance with the Activity's master plan for landscaping. If no master plan is available, ensure that the landscaping is consistent with the practice in the specific local area and climate.

5.17.1.2 Existing Trees and Shrubs: Perform a tree survey prior to any design efforts. Ensure special care has been taken to save as many trees as possible. All trees designated as “exceptional trees” in the tree survey should be preserved.

5.17.1.3 Functionality: Describe landscaping as it relates to the reduction of air conditioning loads, as it averts less desirable views and features, and as it provides privacy. Describe landscaping as it is used to control erosion, solar and breeze exposure, and noise and dust pollution.

5.17.1.4 Native Plants: Describe plant and construction materials selected. Plant materials selected shall be suitable for soils, water and climate of the area.

5.17.1.5 Layout: Indicate type, configuration, and size of trees and shrubs.

5.17.1.6 Ease of Maintenance: Describe plant and construction materials selected as they relate to ease of maintenance and state that are within the maintenance capability of the Station/Activity.

5.17.2 Irrigation Systems:

5.17.2.1 Type System: Describe the irrigation system selected. Selected irrigation system shall be adequate to support the plant growth.

5.17.2.2 Water Conservation: Describe the irrigation system as it relates to water conservation and its components.

5.17.2.3 Residual Pressure: Indicate if an automatic or manual irrigation system will be provided. Indicate residual pressure and flow at point of connection and how this was determined.

5.17.2.4 Calculations: At the 100% submittal stage, provide calculations to verify pipe sizes and to indicate pressure available at the spray heads. Indicate design criteria used. Indicate precipitation rate of each circuit, maximum circuit size, maximum/minimum number of circuits required and the total water system requirement.

5.17.2.5 Ease of Maintenance: Describe irrigation system dependability, durability and ease of maintenance.

5.18 ARCHITECTURAL: The goal is to allocate functional space so as to efficiently and effectively meet the operational needs of the User Activity and to completely integrate all elements of engineering and architecture so that the interior-exterior elements of the facility are energy efficient, functional, aesthetically pleasing, harmonious and compatible (i.e., materials, colors, textures, lighting, furnishings, equipment, spatial relationship, scale, graphics, signage, landscaping, etc.) within themselves and with regard to surrounding structures and environment.

5.18.1 Passive Features: Describe the architectural features which contribute to energy conservation.

5.18.2 Movable Partitions: In administrative and office spaces and other areas, such as classrooms, where flexibility of room size is an item that should be considered, include a statement as to the proposed use of movable partitions.

5.18.3 Sizing of Equipment Rooms: Provide equipment rooms of ample size, with adequate allowances for access, maintenance, repair and easy removal of equipment. Consider future expansion, if foreseen or planned, especially when phased construction is involved. Size the equipment room based upon the assumption that the contractor would procure equipment from the manufacturers of the largest sized equipment in overall dimensions which meet the specified requirements.

5.18.4 Exterior Wall Surfaces. Avoid horizontal recesses and ledges where moisture may accumulate.

5.18.5 Interior Downspouts: Avoid interior downspouts or leaders. If interior downspouts are used, specify cast iron. For maintenance purposes, exterior surface mounted downspouts are preferred.

5.18.6 Roof: Roofing systems shall be in accordance with MIL-HDBK-1011/1, "Tropical Engineering"; the latest Sheet Metal and Air Conditioning Contractors National Association, Incorporated Publication - Architectural Sheet Metal Manual; and NAVFACENGCOM Roofing Design Criteria (Appendix O).

5.18.6.1 Roof Slopes: Minimum slope for new roofs is 1/2 inch per foot. An absolute minimum of 1/4 inch per foot may be considered if adequately justified by the A-E and approved by PACNAVFACENGCOM.

5.18.7 Wet Area Floors: Avoid the use of metal pan construction under shower rooms, drying areas and other "Wet Area" floors. Membrane pan construction is preferred.

5.18.8 Color and Finish Selections: Provide complete color and finish selections for interior and exterior surfaces and describe the basis for those selections. Select colors from Federal Standard 595a where possible. Where not possible, select colors from a national paint manufacturer's color chart (for color only). Provide color and sample boards for all specified exterior and interior paint, tile and finished materials. Select allowable finishes from NAVFAC MIL-HDBK-1001/1, "Basic Architectural Requirements and Design Considerations" or from the NAVFAC Design Manual/MIL-HDBK pertaining to the Facility.

5.18.9 Building Systems: The utilization of off-the-shelf building systems and prefabricated structures is encouraged provided that the project scope is satisfied. Describe such systems and include an economic comparison with other systems.

5.18.10 Wall Finish Selections and Vapor Barrier Placement: Select correct finish and provide correct location of vapor barrier in walls and roof/ceiling of air conditioned and/or refrigerated facilities to minimize moisture migration into rooms and prevent moisture condensation within walls and roof/ceiling. Provide temperature gradient/dew point analysis of walls and roof/ceiling.

5.19 STRUCTURAL:

5.19.1 Selection of Structural Systems: Select the structural systems and materials that are suitable for the type of facility involved, are capable of carrying the required loads, and are compatible with fire protection requirements as well as the architectural and functional building concepts. Consider logical alternative foundations and framing methods when selecting an appropriate structural system. The following elements shall be evaluated and addressed:

- Quantify Total Life Cycle cost effectiveness of the structural system
- Review Constructability
- Determine experience level of local contractors and labor force
- Verify availability and use of local materials

5.19.2 Design Criteria: List design criteria, such as NAVFAC Design Manuals (Structural Engineering Design Manuals), Military Handbooks (MIL-HDBKS), Technical Instructions, DoD and other governmental criteria and guidance, as well as industry standards and commonly accepted methods used as Basis of Design.

5.19.3 Design Loads: The National Technology Transfer Act of 1995, requires the Navy to adopt voluntary consensus standards whenever possible. To comply with the intent of the Law, a Unified Facilities Criteria (UFC) 1-200-01, "Design: General Building Requirements", dated 31 July 2002, has been adopted which references the use of the International Building Code (IBC) 2000 and other governmental and nongovernmental standards and criteria, with modifications as referenced in the UFC. A copy of UFC 1-200-01 may be obtained from the NAVFAC Engineering Innovation & Criteria Office (EICO) web site at http://www.efdlant.navfac.navy.mil/criteria/publications.htm.

5.19.3.1 Seismic Safety: All facilities, regardless of location, shall provide a minimum level of protection against the effects of a seismic event considering structural life safety, essential operational requirements, and the protection of capital investment. The seismic safety criteria for all Navy occupied facilities is provided by the NAVFAC letter of 2002, "Seismic Safety Criteria for Navy/Marine Corps Owned and Leased Buildings".

a. New Buildings: New buildings shall be designed according to the IBC 2000 with the revisions specified in UFC 1-200-01 "Design: General Building Requirements".

b. Existing Buildings

1. Executive Order (EO) 12941, Seismic Safety of Existing Federally Owned or Leased Buildings, 1 Dec 1994, provides the basis for the seismic criteria for existing buildings. The EO adopted the ICSSC RP4, which has been updated by the ICSSC RP6, Standards of Seismic Safety for Existing Federally Owned or Leased Buildings, dated 18 January 2002, as the minimum standards. A copy of the ICSSC RP6 is available at the Building and Fire Research Laboratory of the National Institute of Standards and Technology in their BFRL Publication on-line library at http://fire.nist.gov/bfrlpubs/.

2. Outside U.S. The Navy has modified and extended the EO requirements to existing Navy owned and leased facilities outside of the United States and its territories. Guidance is provided by the Naval Facilities Engineering Command, Seismic Hazards Mitigation Program for Facilities Outside of the Continental United States, its Territories and Possessions, March 2000.

3. Evaluation and Mitigation. EO 12941 and ICSSC RP6 requires mandatory evaluation and mitigation of unacceptable risks of any Federally owned or leased facility that undergoes a rehabilitation, repair, and/or modernization that is affected by any of the following situations:

1) Change in the building's function which results in a significant increase in the building's level of use, importance, or occupancy;

2) Significantly extends the building's useful life through alterations or repairs which total more than 30% of the replacement value of the facility;

3) Building or part of the building has been damaged by fire, wind, earthquake or other cause that in the judgment of the agency, significant structural degradation of the building's vertical or lateral load carrying systems has occurred;

4) Building is deemed to be an exceptionally high risk to occupants or the public at large; or

5) Building is added to the Federal inventory through purchase or donation after adoption of the Standards.

4. Criteria. Seismic design criteria for seismic evaluation and rehabilitation of existing buildings shall be in accordance with TI-809-05, Seismic Evaluation and Rehabilitation for Buildings, dated November 1999. The seismic upgrade guidelines are generally in accordance with the Federal Emergency Management Agency (FEMA) 310 "Handbook for the Seismic Evaluation of Buildings" for evaluation; FEMA 273 "NEHRP Guidelines for the Seismic Rehabilitation of Buildings" and TI-809-04 "Seismic Design for Buildings" for analysis and acceptance criteria; and FEMA 302 "NEHRP Recommended Provisions for Seismic Regulation for Buildings and Other Structures" for design and detailing requirements for the addition of new structural components or systems. The TI is available on the internet at the following website: http://www.hnd.usace.army.mil/techinfo/ti/809-05/80905page.htm.

c. Piers and Wharves. Seismic design criteria for piers and wharves shall be in accordance with the requirements of the UFC 1-200-01, which specifies the use of the Technical Report TR-2069-SHR, "Design Criteria for Earthquake Hazard Mitigation of Navy Piers and Wharves". A

copy of the TR is available at the following website: http://www.nfesc.navy.mil/pub_news/tm-tr/tr2069.pdf.

5.19.3.2 Wind Design: Wind design criteria shall be in accordance with the requirements of UFC 1-200-01. The UFC specifies the use of IBC 2000 which specifies the use of Section 6 of ASCE 7 with exceptions as stated in the IBC. For areas where the basic wind speed is not identified in ASCE 7 or UFC 1-200-1, use locally available wind data converted to a 3-second gust speed at 33 ft above the ground in exposure category C with an annual probability of 0.02 of being equaled or exceeded (50-year mean recurrence interval).

5.19.3.3 Anti-Terrorism/Force Protection (AT/FP): All inhabited buildings must meet the requirements of UFC 4-010-01 dated 31 July 2002, DoD Minimum Antiterrorism Standards for Buildings, including progressive collapse requirements of the UFC. The UFC supersedes the interim standard issued December 1999 and referenced in DoD Instruction 2000.16 "DoD Antiterrorism Standards". The UFC applies to all DoD components. The UFC is for Official Use Only, and can be obtained from the Project Design Engineer, for those projects requiring to meet the AT/FP standards.

5.19.4 Foundation Conditions: Describe foundation conditions, type of foundation to be used, method employed to determine bearing values and maximum dead load and live load soil capacities. Indicate level of ground water. Provide allowable passive and active soil pressures and co-efficient of friction for retaining wall design.

5.19.5 Type of Construction: Describe type of construction and framing adopted, reasons therefor and an economic justification if a choice is available. Describe any special or unusual features.

5.19.6 Materials: State type of material for each major structural unit and structural system.

5.19.7 Special Features: Describe special features to be included in the structure which are not evident from a definitive drawing.

5.19.8 Structural Floor and Roof System: Describe the structural floor and roof systems proposed, with length and spacing of principal members (for beam and girder, etc.), if other than standard drawings are proposed.

5.19.9 Live Loads: Include a statement of live loading to be used. Include floor and roof loads, wind and earthquake, and any special loads with the source of the criteria and data to justify their use. Include mooring and deck live loads for waterfront structures.

5.19.10 Lateral Forces: Describe the structural system to be employed to resist lateral forces for the structure and associated equipment

including mechanical, electrical and architectural. List Seismic Zone and wind velocity and what parts of the design are controlled by each.

5.19.11 Special Considerations: Include a statement of any special considerations that would affect the design, including slanting and fallout shelter requirements.

5.19.12 Calculations: Provide sufficient structural calculations to verify the framing system, and major structural elements for loads including wind and seismic.

5.20 MECHANICAL:

5.20.1 Heating, Ventilating and Air Conditioning (HVAC): Design the HVAC systems in strict accordance with MIL-HDBK-1190 and MIL-HDBK-1003/3, "Heating, Ventilating, Air Conditioning and Dehumidifying Systems" unless specified otherwise by the "SCOPE" or by written waiver from the Officer in Charge. In the design as well as selection of the appropriate HVAC systems, consider economic and energy conservation aspects in arriving at the optimum design solution. Consider such design factors as siting, orientation, insulation alternatives, reflective surfaces, solar shading, fenestration, glazing types and natural ventilation. Also consider and compare alternate solutions based on initial installation, operation and maintenance costs.

5.20.1.1 Solar Energy: State that solar energy applications for domestic hot water and space heating were considered.

5.20.2 Heating: State the indoor and outdoor design temperatures and "U" factors for walls, ceilings, floor, etc., to be used in the design. Include a general statement regarding the ability of an existing mechanical system to carry the load when the existing system is expanded or modified. Describe the heating medium, such as steam, hot water, gas or electric, and the type of heating system such as convector, baseboard, forced warm air or unit heater. Describe the type of temperature control, such as electric, electronic or pneumatic, and indicate energy conservation control systems to be incorporated. Describe the equipment to be used such as boilers, convectors, registers, type of pipe, etc.

Indicate the location of the heating plant. Include a brief explanation of the basis for the selection of the type of fuel, including an economic comparison with other fuels. Address solar energy feasibility and applications. Consider energy storage as a means for handling peak loads without creating corresponding peak demands on utility, also as a help in down-sizing HVAC equipment.

5.20.2.1 Electrical Resistance Heating: Ensure electrical resistance heating is
limited to applications indicated in NAVFACINST 4l00.4B, Electric Resistance Space and Domestic Water Heating.

5.20.3 Air Conditioning and Ventilation: Follow applicable design policies and criteria described in the MIL-HDBK-1190 and DM-3.01 "Plumbing Systems." Also, follow recommendations in "Air Conditioned Buildings in Humid Climates, Guidelines for Design, Operation, and Maintenance." In many instances an economic analysis is required before certain selections can be made. Provide these analyses, taking into consideration the equipment, first costs, operating costs and maintenance costs over the period specified by the latest criteria. Furnish a report, complete with necessary back-up data and calculations, at the 60% submittal. Furnish computer floppy disk (3 1/2 inch) on input made for Carrier and Trane Ultra programs. Consider energy storage as a means for handling peak loads without creating corresponding peak demands on utility, also as a help in down-sizing HVAC equipment. Consider the use of natural ventilation in lieu of air conditioning for space cooling.

5.20.3.1 Air Conditioning: Provide a brief description of the air conditioning system proposed, such as the type of air system or type of terminal unit, type of refrigeration systems, size, factory or built-up systems, any redundancies and facility for expansion, etc. Specify areas to be air conditioned and whether air conditioning is authorized in accordance with MIL-HDBK-1190. The values for the U-factors and R-factors noted in Table 8.4 of MIL-HDBK-1190 are to be considered mandatory unless specified otherwise by the “SCOPE” or by written waiver from the Officer in Charge.

5.20.3.2 Ventilation: Discuss ventilation required by criteria and the means to be used to accomplish dilution ventilation, exhaust ventilation, make-up air, etc.

5.20.3.3 Design Temperatures: State the required inside temperatures and relative humidities and outside wet and dry bulb design temperatures. Outside design temperature should correspond with NAVFAC P-89, "Engineering Weather Data." Include "U" factors for the type of construction proposed and a statement of the economics of applying insulation and/or sun shades.

5.20.3.4 Equipment: Describe equipment to be used, such as reciprocating or centrifugal compressor, condensers, air handling equipment, duct system, piping, etc., and type of building temperature control system such as electric, electronic or pneumatic and sequence of operation. To preclude problems with proprietary equipment and for large equipment requiring clearances for installation and maintenance, ensure that several manufacturers products can satisfy the contract requirements and is suitable for the space allocated. List the manufacturers and model numbers and include catalog cuts for all major equipment in the Basis of Design.

5.20.3.5 Design Analysis: The final design analysis shall have complete cooling load calculations, a psychrometric chart with conditions shown and manufacturers' equipment listed that would satisfy

the design. Provide explicit balancing and testing procedures for extensive systems.

5.20.3.6 Controls: Design Air Force projects in accordance with Air Force Engineering Technical letter ETL 83-1 and Change 1 Design of Control Systems for Heating, Ventilation, and Air Conditioning Systems. This requires the designer to use design instructions, control drawings and technical specifications attached to Change 1 to ETL 83-1 for all Air Force (except SAC) HVAC design and construction. For SAC HVAC designs, use SAC standard HVAC control drawings. Design Navy projects in accordance with UFGS-15901 and UFGS-15910. The intent is to provide a control system which is simple to trouble shoot and maintain and to provide complete detailed maintenance documentation.

5.20.4 Plumbing: Base plumbing fixture quantities on occupancy allowances for naval shore facilities, except that plumbing fixtures for the physically handicapped shall be provided in accordance with Federal Standard 795, "Uniform Accessibility Standards" (April 1, 1988). Indicate the type of materials proposed for water pipe, soil pipe, stacks, etc. Use the fixture unit method to size supply and drain lines as described by the Uniform Plumbing Code. The International Plumbing Code shall generally be used as the reference plumbing code. Indicate the type and size of heater for hot water supply. Single drainage/vent stack systems (e.g. Philadelphia System, Sovent System, etc.) and air admittance valves shall not be allowed.

5.20.5 Distribution Piping: Locate distribution piping to serve the interior within the building structure and conceal where possible. Minimize foundation wall piping penetrations. Limit piping under slab on grade.

5.20.6 Refrigeration (Cold Storage): Identify the areas to be refrigerated indicating the usage and temperatures to be maintained. Indicate outside design dry and wet bulb temperatures, type of refrigeration equipment, location, and the type and thickness of area insulation.

5.20.7 Fuel Storage and Distribution: Comply with criteria in MIL-HDBK-1022, "Petroleum Fuel Facilities." For liquid petroleum products and gas distribution identify the type, location of takeoff from supply and available pressure, location of any pressure-reducing stations, and distribution pressure. Describe the unloading facilities such as dock, tank car or truck, type of system and proposed features for liquid petroleum and liquified petroleum gas (LPG) systems. Indicate basis for storage capacity, pumping rates, vaporization requirements, number of dispensing outlets, and provisions for facility expansion. Describe power supply and power requirements. Select type and materials for piping, tanks and valves where applicable. The final design analysis shall give complete pressure drop calculations for the required flow rates. Complicated systems, such as hydrant fueling, require special operating instructions and charts and detailed tests to check correct operation.

5.20.7.1 Fuel-Oil-Fired Plants: Indicate source of fuel oil, method and schedule of delivery; oil consumption and storage requirements; sulphur content of fuel oil, the pollution control requirements; storage tank location, piping, pumping and preheating requirements.

5.20.7.2 Fuel Selection: State that fuel selection is in accordance with OPNAVINST 4l00.6.

5.20.8 Industrial Ventilation: For projects involving industrial ventilation, present calculations in the format outlined in the American Conference of Government Industrial Hygienists (ACGIH) Industrial Ventilation Manual. Programmable calculations and computers can be used to provide automated design of entire systems in accordance with the ACGIH format. Use equivalent foot method or velocity pressure method. Any other format will not be accepted. Achieve air balance without blast gate adjustment by the use of the Balance by Design Method. The blast gate method, which provides for air balance by adjustment of blast gates, shall not be allowed.

5.20.9 Utilities: A mechanical engineer shall be responsible for the design of steam/condensate, high-temperature water, chilled water, gas, compressed-air, and fuel-oil systems outside the building.

5.20.10 Tempered Water Supply for Lavatories Located on Navy/Marine Corps Facilities on Oahu: The following policy concerning the availability of tempered water at Navy/Marine Corps facilities **currently existing** on Oahu applies:

a. Tempered water will **not** be required at handwashing facilities outside of food preparation areas **if the original design of the building did not require hot water piping to the fixture.**

b. Tempered water **will** be required at hand washing facilities where adequate plumbing is provided for in the design of the building.

c. Tempered water **will** be required at hand washing facilities located within food preparation areas (or close proximity) and designated specifically for use by food handlers during normal food service operations.

Section 1-4, paragraph 8c(7) of NAVMED P-5010, CH 1, directs the Medical Department Representative to "review local plans and design specifications relating to construction of new food service facilities and renovation of existing facilities." This will be done to ensure compliance with public health requirements; the policy set forth in subparagraph a. above **does not apply** to **new** construction/renovation.

5.21 ELECTRICAL:

5.21.1 Interior Distribution Systems: Include electrical characteristics (phase, voltage and number of wires) of circuits and a breakdown of the estimated connection load to show:

a. Lighting and convenience outlet load.

b. Power load for building equipment such as heating, air conditioning, etc.

c. Loads for special operating equipment such as compressors, generators, pumps and for power receptacles being provided to energize special equipment. Apply an appropriate demand factor to each to compute total demand load.

d. Show the type of wiring system, such as rigid conduit, electrical metallic tubing, nonmetallic sheathed cable, etc., and where proposed for use.

e. Indicate type of conductors, such as rubber insulated, varnished cambric insulated lead covered, etc., and where proposed for use.

f. Include a statement describing proposed pertinent standards of design, such as voltage drop, lighting intensities and type of lighting fixtures.

g. Determine the short circuit duty required for protective devices and switchgear and the proper selection and setting of protective devices to insure that the electrical system will be properly coordinated.

h. Indicate the type and arrangement of telephone, signal, security and fire alarm systems.

i. Indicate an equipment ground wire shall be run with circuits of 225 amperes and less. Size the equipment ground in accordance with NEC Table 250-95.

5.21.2 Exterior Distribution Systems: Include a statement relative to the adequacy of the primary supply at the point of takeoff. If primary source is inadequate, state measures proposed to correct deficiency.

a. Indicate the electrical characteristics of power supply to the Station or portion involved, including circuit interrupting requirements and voltage regulation.

b. Estimate the total connected load and resulting kilowatt demand load by applying proper demand and diversity factors, if a group of loads is involved.

c. Show the basis for selection of primary or secondary distribution voltage.

d. Indicate the type of conductors, such as copper or aluminum, and where proposed for use.

e. Include a statement describing pertinent standards of design, such as voltage drop, physical characteristics of overhead or underground circuits, type of street lighting units and lighting intensities.

f. Describe the type and adequacy of telephone, signal and fire alarm systems, including a statement as to number of spare telephone conductors available and spare capacity on fire alarm circuit; also give location of nearest fire alarm box and fire alarm circuit.

g. Determine the short circuit duty required for protective devices and switchgear and the proper selection and setting of protective devices to insure that the electrical system will be properly coordinated.

h. When designing facilities that accommodate nonlinear and harmonic loads, use design practices noted in Appendix X.

5.21.2.1 Ductlines: State in the 60% submittal that the spare ductlines proposed for use are adequately sized and have been "blown and rodded" (i.e. a 12-inch-long mandrel, 1/4 inch less than the inside diameter of the duct, has been pulled through the entire length of the ductline) as verification of their usability. Use of wire brushes in lieu of mandrels is not considered adequate verification of a duct's usability. Obtain written approval of conduit and duct assignments from the appropriate office (PWC, Base Civil Engineers, Staff Civil Engineers, etc.). Visually inspect for asbestos materials and state if there is the possibility that asbestos material is present.

5.22 ELECTRONIC SYSTEMS:

5.22.1 System Engineering Concepts: Include type and description of systems and equipment capable of performing the desired functions, any special coordination necessary to achieve required overall system performance, and any new techniques proposed.

5.22.2 Equipment to be Utilized: Indicate equipment to be utilized and identify categories such as:

a. Government-furnished equipment; identifying new or relocated items.

b. Commercially available items.

c. Special equipment requiring research or developmental work.

d. Special site or location considerations.

e. Antenna requirements, including types, separation, mounting height and method, aircraft obstruction marking, foundations and grounding.

f. Types of antennas, transmission lines, method of installation, termination, switching, etc.

5.22.3 Communications-Electronics System Basic Requirements: Describe the communications-electronics system basic requirements, such as:

a. Radio circuit requirements, including number of circuits and frequencies to be utilized. Where radio transmission is involved, advise the PDE of the transmission characteristics to determine the need for frequency assignment from the Joint Frequency Panel, Washington, D.C.

b. Wired circuits required, indicating those for voice, remote control, etc.

c. Radio frequency bonding and grounding requirements.

d. Equipotential ground system including lightning protection system.

e. Radio frequency shielding requirements and proposed type and construction of shielding enclosure, filtering of circuits, etc.

f. Proposed method of interconnecting wiring and cabling for equipment with special attention to security requirements where applicable.

g. Proposed equipment layout, including racks, consoles, patch panels, distribution frames, etc., with special attention to security requirements where applicable.

h. Power and lighting requirements, including emergency or no-break supply and proposed method of supply and distribution of special voltages or frequencies. Indicate demand load of electronic equipment, including allowance for expansion, and demand and diversity factors used.

i. Electronic equipment environmental air conditioning requirements, including heat load of equipment.

j. For radar installations, indicate azimuth of coverage and any special precautions to achieve safety to personnel and to minimize interference with other operations.

5.22.4 Telecommunications, Signal, Telemetry Systems: Describe the type and arrangement of telephone, signal systems, telemetry and fire alarm systems including a statement as to number of spare conductors

available. Indicate source and connections to existing systems. Determine current criteria from local telephone utility company for manholes, ducts, etc., required for the proper design of the communication system, and furnish copies with the 35 percent submittal. Where applicable, include descriptions of equipment and consoles.

5.22.4.1 Telephone/Communications Installation:

a. The Naval Computer and Telecommunications Command and NAVFACENGCOM signed a Memorandum of Understanding in 1993 which transferred the cost for interior and exterior building wiring to the NAVFAC MCON/BRACON budgets. Additional information is provided in COMNAVTELCOM ltr of 29 Oct 93 on communications cabling system, attached at the end of this section. This cost includes the cost of cabling from the Local Exchange Carrier to the customer receptacle. The customer must fund the telephone instruments and other equipment. The cost of the cable distribution transport systems including manholes, duct banks, cable trays, and handholes should be included in the MCON/BRACON budgets. The MCON/BRACON budgets only covers government owned cable plant. If the cable plant is leased or owned by the Local Exchange Carrier, other resources are required. The cost of cabling should be included on the DD 1391 Block 9; under information systems. Project design scopes should include all backbone, horizontal, premises, and station cabling systems.

b. On 1 Oct 95, the PWC PEARL Activity Providing Telephone Services (APTS) transferred to NCTAMS EASTPAC. The functional transfer will not affect the current level of telephone support previously provided by PWC PEARL. NCTAMS EASTPAC POC: Code N2, (808) 653-1111.

c. For MCBH telecommunication projects, refer to the following standards attached at the end of this section: (1) USMC Standards for Telephone Switching Systems, Inside Plant (ISP) Installation, Outside Plant (OSP) Installation; (2) USMC Standards for Base Area Network. See electronic files: TSS Standards and BAN Standards.

5.22.4.2 Hawaii Area: Dedicated telecommunication manholes/handholes are required in those areas that do not have separate underground facilities for power and communication cables.

5.22.5 High Altitude Electromagnetic Pulse (HEMP): Command, Communication and Control (C^3) Facilities design shall consider/make provisions for HEMP protection in accordance with DOD MIL-HDBK-423, "High Altitude Electromagnetic Pulse Protection for Ground-Based Facilities."

5.22.6 Prewiring: Building prewiring requirements for telecommunication (voice, data, and video) systems shall be provided and installed in accordance with MIL-HDBK-1012/3 and TIA/EIA 568/569 Standards.

a. Telephone - Hawaii Area: POC NCTAMSPAC N23, Mr. Gregg Gardner at (808)471-0136 ext. 229.

b. Cable T.V. NCTAMSPAC N2, Ms. Lisa Pope at (808)471-0136 ext. 239.

For BEQ/BOQ and NEX activities, the activity/quarters managers should be contacted to ascertain who the T.V. service provider will be and what service provisions must be provided for the particular service contractor. PACNAVFACENGCOM DPM404 is the POC for technical/design matters.

5.23 CATHODIC PROTECTION: See COMNAVFACENGCOM ltr Code 15C of 11012 04C/cmm of 31 May 94 at the end of this section.

a. Provide results of soil resistivity measurements.

b. Provide results of pH tests.

c. Indicate variations in soil make-up.

d. Indicate soil moisture content and normal seasonal variations.

e. Provide results of structure to soil potential measurements where protection is to be provided for existing underground structures or where buried test specimens are used for new installations.

f. Provide results of temporary cathodic protection tests, if any, under same conditions described in item immediately above.

g. When cathodic protection systems are to be installed in areas known to be occupied by existing underground utility systems, provide results of a cathodic interference survey on all existing systems.

5.24 UTILITIES:

5.24.1 General: Describe the impact of the added load on the activity distribution system with particular regard to:

a. Energy Conservation;

b. Adequacy of affected portions of the system to carry the increased load;

c. Adequacy of the service entrance to carry the increased load, in the case of purchased utilities;

d. Adequacy of on-station boiler plant (or other generating plants) to carry the increased load; and

e. Cumulative effect of other projects in the active or planned stages. The PDE will provide information on the other projects.

5.24.2 Utility Connections and Interruptions: Describe connections and interruptions to utility services and arrangements made with the user and the appropriate office or activity responsible for providing such service; i.e., PWC, the activity or commercial utility for any special requirements during cutover. Describe the responsibilities of the Government and construction Contractor during interruption and connection; i.e. who furnishes labor, material, and equipment.

5.24.3 Location of Underground Utilities: State whether toning is required. Coordinate with the PDE whether construction Contractor or A-E to perform toning. Generally the Pearl Harbor Shipyard areas require toning to be accomplished by the A-E. Coordinate with the Department of Army, Headquarters, United States Army Garrison, Hawaii, Fort Shafter, Hawaii 96858-5000, Directorate of Information Management (DOIM), telephone (808) 438-3514, on the location of existing Joint Trunking System (JTS) cable pathways within your project limits.

5.24.4 Projects Requiring No Utility Contract Modifications: For projects supportable using existing contract capacity agreements, describe the quantitative and qualitative analysis for the proposed new requirements, the existing peak usage-to-date, and the existing contract capacity agreements.

5.24.5 Projects Requiring a Contract Modification: Provide the following:

5.24.5.1 Sewer and Water: Describe design pipe sizes, flow rates, pressures and estimated quantity and quality requirements.

5.24.5.2 Telephone: Describe communication requirements in terms of quantity and types of service. Coordinate with NCTAMS EASTPAC (Code N2) (808) 653-1111.

5.24.5.3 Fuel: Describe pipe sizes, flow rates, pressures, quantity and quality requirements.

5.24.5.4 Steam: Describe pipe sizes, flow rates, pressures, quantity and quality for both steam and condensate return.

5.24.5.5 Electric: Describe the design characteristics, phase, voltage, current and power. Also include the estimated peak demand, energy requirement and future growth.

5.24.6 Projects Requiring a New Utilities Service Contract: Provide the same information as above.

5.24.7 Coordination with PACNAVFACENGCOM Commercial Utilities Branch: The Navy utility service contracts are negotiated agreements and are the responsibility of the PACNAVFACENGCOM Commercial Utilities Branch; therefore, contacts with commercial utility companies regarding Navy

projects must be coordinated with that office. Additionally, identify projects requiring long lead time for construction by a utility company.

5.25 PHYSICAL SECURITY AND ANTITERRORISM/FORCE PROTECTION (AT/FP):

5.25.1 General: Design projects involving physical security hardening or improvements utilizing the concepts outlined in MIL-HDBK-1013/1, "Design Guidelines for Physical Security of Fixed Land-Based Facilities." The type of facility will dictate which reference criteria will apply, such as, OPNAVINST 5530.13, "Physical Security Instructions for Sensitive Conventional Arms, Ammunition and Explosives," OPNAVINST 5530.14, "Physical Security and Loss Prevention Manual," OPNAVINST 5330.15, "Military Police Physical Security," and Interim Department of Defense Antiterrorism/Force Protection Construction Standards (16 Dec 99) and Interim USCINCPAC Honolulu message 261800Z Jun 00 providing AT/FP Construction Standards Guidance. There may be inconsistencies in the specific criteria which will have to be resolved by the PDE. Some of the facilities with a requirement for physical security are as follows:

Armories
Arm Rooms
Weapons and Explosives Storage Facilities
Ready Service Lockers
Terminal Equipment Buildings
Communication Buildings
Sensitive Compartmented Information Facilities
Medical Facilities
Flight Lines
Waterfront Facilities
Other Controlled Areas

5.25.2 Antiterrorism/Force Protection:

AT/FP - Planning/Design Process. Obtain the completed Facility Assessment - AT/FP Threat Questionnaire (blank attached at the end of this section) to determine AT/FP requirements.

5.25.3 Intrusion Detection Systems (IDS): Provide the design of the conduit system, electrical power, and monitor station to support the IDS system for MILCON/MCON projects. Coordinate requirements with NAVELEXCEN Charleston through the PDE. Check with the PDE to determine design responsibilities for other than MILCON/MCON projects.

5.25.3.1 Identification of IDS Requirements: Often IDS requirements are not specifically identified in the 1391 forwarded during the initial planning phase of a project. Early query of IDS requirements will provide the activity time to investigate and confirm with their Security Officer whether IDS is a requirement for their new facility and to determine specific IDS systems components required. The current goal is to install uniform types of IDS components, large and small systems, for

ease in long-term maintenance and lower cost. Criteria for Commercial Intrusion Detection System (IDS) shall be per NAVFAC DM-13.02.

5.26 ENGINE GENERATORS:

5.26.1 Engine Generator General Requirements: Engine generators shall generally conform to requirements in MIL-HDBK-1003/11, "Diesel Electric Generating Plants" and applicable NAVFAC guide specifications.

5.26.2 Mechanical Consultant: Ensure that a mechanical consultant is responsible for all aspects of the diesel engines and related accessories, including the required calculations. Information obtained solely from vendors will not be acceptable.

5.26.3 Required Information: Provide the following information.

a. That engine generators conforming to contract specification and drawing requirements are commercially available and that adequate equipment room space is available for installation and maintenance. Include a list of available engine generators that meet project requirements.

b. Calculate or obtain information on BMEP, engine speed, and fuel consumption on engine generators that are commercially available and appear to meet project requirements.

c. Calculate the following for prime duty units: Estimated fuel cost for the first year of operation, estimated excess fuel cost (May be percentage of first year fuel cost), using projected hours of operation from the applicable guide specification. When bid evaluation and compensatory damages are included in a construction contract specification, a copy of the basis for evaluation and compensatory damages shall be forwarded to the Contracting Officer for retention in the construction contract file. NAVFACENGCOM policy requires that the compensatory damages (a form of liquidated damages) be reasonable and supported by calculations placed in the contract file.

d. Verify applicability of regional air pollution regulations for engine generator exhaust and include provisions for compliance if they apply or the basis for exception if they do not apply.

5.27 ACQUISITION OF COMPUTER SOFTWARE AND DATA:

5.27.1 Compliance with Acquisition Regulations: Comply with Department of Defense Federal Acquisition Regulations Supplement (DFARS) cited in Section 8, including the following:

5.27.1.1 Minimum Needs: Establish minimum Government needs for software and data in consultation with PACNAVFACENGCOM and the activity and provide project documents that will satisfy these Government needs. Prepare written questionnaires, survey existing construction and activity operations, interview cognizant personnel involved in activity

operation, and review plans and specifications of pertinent prior projects to establish Government needs. Consider requirements for expansion, modification, operation, or maintenance and service. (If DFARS is revised, refer to the appropriate paragraph.) The requirement for a market survey is necessary to determine whether or not the data is commercially available. If data is non-commercial, the special license agreement will be written by experts and only what can be released by contractor will be included in the contract.

5.27.1.2 Contract Documentation: Provide for required contract documentation including a list of items, data, software, components, processes and rights therein to be delivered with other than unlimited rights.

5.27.1.3 Contract Clauses: Assist the Contracting Officer in inserting required DFARS contract clauses in the project specifications. Contract clauses will be in the Contracts Office portion of the bid package and not in the A-E technical specifications.

5.27.1.4 Software Standards: Include in the project specifications detailed descriptions for all necessary software, data, and documentation to comply with DOD-STD-2167, "Defense System Software Development," or other approved standards so that the items can be extracted and listed on DD Form 1423 as required.

5.27.1.5 DD Form 1423: Furnish filled in DD Form 1423 to be used in bidding or negotiation. Furnish bid item list in the prescribed format. If DOD-STD-2167, which lists appropriate Data Item Descriptions (DID), is not used as the software development standard, perform the required research and select the appropriate DIDs to be used on the DD Form 1423.

5.27.1.6 Software Package Information: Provide or recommend to the Government a means of determining if a software package had been developed at private expense; provide this in conjunction with required contract documentation above. In addition, during the development of the project specifications, furnish a list of commercially available software packages which will provide all or part of the functions, data, and documentation required in the project and the names and addresses of the vendors. Also provide the names and addresses of the installations where the software package has been in satisfactory use for at least 2 years. Note important exceptions taken by vendors, such as reluctance or refusal to furnish documentation desired by the Government for future expansion, modification, operation, or maintenance and service. Review commercial licensing agreements and assist the Contracting Officer in preparing special licensing clauses if additional rights are needed to be written into the contract.

5.27.2 Quality Assurance: Provide requirements in the project specifications for software development and quality assurance by the Contractor in accordance with DOD-STD-2167 or other standards as approved.

5.27.3 Cost Estimates: Provide detailed cost estimates of software and other data to be furnished.

5.28 NONDOMESTIC AND PROPRIETARY MATERIALS: Identify and provide written justification why these materials are required. PACNAVFACENGCOM approval is required prior to including in plans and specifications.

Asbestos Notification of Demolition & Renovation
(Ref. HAR Chapter 11-501)

SEND TO: STATE DEPARTMENT OF HEALTH
NOISE, RADIATION & INDOOR AIR QUALITY
INDOOR AIR QUALITY SECTION
591 ALA MOANA BOULEVARD, 1ST FLOOR
HONOLULU, HAWAII 96813
Phone (808) 586-5800 Fax 586-5811

I. **Type of notification:** O=original R=revised C=cancelled		
II. **Type of operation:** D=Demolition R=Renovation OD=Ordered Demolition ER=Emergency Renovation		
III. **Facility information**		
Owner name:		
Address:		
City:	State:	Zipcode:
Contact person:		Telephone #:
Removal contractor:		License #:
Address:		
City:	State:	Zipcode:
Contact person:		Telephone #:
Other operator:		
Address:		
City:	State:	Zipcode:
Contact person:		Telephone #:
IV. **Is asbestos present (y/n):** Inspector's name:	Certification #:	State of certification:
V. **Facility description (Include building number, floor and room number)**		
Building name:		
Address:		
City:	State:	Zipcode:
Site location:		
Building size (sq. ft.):	# Floors:	Age:
Present use:	Prior use:	
Official Use Only		
Postmark Date:	**Received by:**	**State Record Number:**

2/01

VI. Procedure used to detect the presence of asbestos
Laboratory name: Analytical method

VII. Specify the nature of the asbestos material (TSI, surfacing, VAT, miscellaneous):

Amount of asbestos, including: 1. RACM to be removed 2. CAT I left in place, and 3. CAT II left in place	RACM to be removed	Nonfriable ACM not to be removed	
		Category I	Category II
Pipes (linear ft.)			
Surfacing (square ft.)			
Facility components (cu. ft.)			

VIII. Scheduled asbestos abatement dates
Start (mm/dd/yy): Finish (mm/dd/yy)

Circle workdays and times: weekdays: daytime nighttime
weekends: daytime nighttime

IX. Scheduled renovation/demolition dates
Start (mm/dd/yy): Finish (mm/dd/yy)

Circle workdays and times: weekdays: daytime nighttime
weekends: daytime nighttime

X. Description of the planned renovation/demolition work and methods to be used:

XI. Description of the work practices and engineering controls to be used to prevent emissions of asbestos from the work-site:

Project designer name: Certification #: State:

XII. Waste transporter #1

Name:		
Address:		
City:	State:	Zipcode:
Contact Person:	Telephone:	

Waste transporter #2

Name:		
Address:		
City:	State:	Zipcode:
Contact Person:	Telephone:	

XIII. Waste disposal site:

Facility Name:	Telephone:	
Address:		
City:	State:	Zipcode:

XIV. For demolition ordered by a government agency, please identify:

Name:	Title:
Authority (Agency):	
Date of order (mm/dd/yy):	Date ordered to begin (mm/dd/yy):

XV. For emergency renovations:

Date and time of emergency
Date (mm/dd/yy): Time: (a.m./p.m.)

Description of sudden, unexpected event and the damage caused:

Explanation of how the event caused an unsafe condition or would cause equipment damage or an unreasonable financial burden:

Person contacted for approval at the Noise, Radiation & Indoor Air Quality Branch:

Name: Date (mm/dd/yy): Time: (a.m./p.m.)

XVI. Description of procedures to be followed in the event that unexpected asbestos is found or previously nonfriable asbestos material becomes crumbled, pulverized or reduced to powder:

XVII. I certify that an individual trained in the provisions of Hawaii administrative rules chapter 11-501, and certified as a contractor/supervisor, will be on-site during the entire renovation and/or demolition and evidence that the required training has been accomplished for this and all workers will be available at the work-site.

_____ _____
Signature of owner/operator Date (mm/dd/yy):

XVIII. I certify that the information on this notification is correct.

_____ _____
Signature of owner/operator Date (mm/dd/yy):

XIX. Additional Comments:

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
1510 GILBERT ST
NORFOLK, VA 23511-2699

IN REPLY REFER TO:
11300
Ser EICO/tjh
01 MAR 2001

From: Commander, Naval Facilities Engineering Command, Engineering Innovation and Criteria Office (EICO)
To: Distribution

Subj: ITG 01-01 INTERIM TECHNICAL GUIDANCE (ITG) "ELEVATOR DESIGN"

Ref: (a) Design Manual-3.09, Elevators, Escalators, Dumbwaiters, Access Lifts and Pneumatic Tube Systems
(b) NAVFAC Guide Specifications (NFGS) – 14210, Electric Traction Elevators
(c) NAVFAC Guide Specifications (NFGS) – 14240, Hydraulic Elevators
(d) Maintenance and Operations Manual, MO-118, Inspection of Vertical Transportation Equipment

Encl: (1) NAVFAC Elevator Design Guide dtd 10 JAN 2001

1. Purpose. To provide interim technical guidance for provision of elevators, including the coordination of design efforts among the various design disciplines. The guidance may be retained for record purposes until it is incorporated into the criteria as noted in paragraph 4.

2. Background. Elevators are required to be provided at certain locations, by statutes, regulations, codes, and Navy criteria. Examination of the existing Navy criteria, construction and inspection reports of less than satisfactory installations, and excessive change orders has resulted in the refinement of elevator design procedures.

3. Discussion. See enclosure (1). It supplements reference (a), and coordinates the functional requirements among the various design disciplines.

4. Criteria. The NAVFAC Criteria Office will revise the appropriate sections of references (a) through (d), as appropriate.

5. Coordination. This ITG has been coordinated with NAVFAC HQ Fire Protection, and Safety Offices.

6. Action.

a. Design and Construction. Design all new projects using this guidance. Revise all projects under design, but not completed, to comply with the guidance where funds and schedule permit. Modify Navy projects currently under construction and amend advertised construction projects to conform to the enclosed guidance where funds and schedule permit. Use this guidance to the extent practicable for all elevator repair and replacement projects.

b. Maintenance and Operations. Continue to maintain and operate in accordance with MO-118.

7. Points of Contact. For additional information concerning elevators, the following points of contact are provided:

a. NAVFAC Criteria Office – Mr. Thomas J. Harris, P.E. at DSN 262-4206, commercial 757-322-4206, FAX at 4416 or via Internet at harristj@efdlant.navfac.navy.mil;

b. NAVFAC Elevator Program Manager – Mr. Kevin Morse at DSN 262-4653, commercial 757-322-4653, or via the Internet at morsekp@efdlant.navfac.navy.mil.

c. NAVFAC CHIEF FIRE PROTECTION ENGINEER – Mr. Joseph Simone at DSN 325-9177, commercial 202-685-9177, Fax at 1577, or via Internet at simoneja@hq.navfac.navy.mil.

R.D. CURFMAN, P.E.
By direction

Distribution:
COMNAVFACENGCOM (Safety/Gott, Fire/Simone, Dir. B.H./Periygo, Dir. P.W./Salter, P.W. Fac. Sect. Head/Singh, P.W./Killen, Eng. Sect. Head/Hinson, Med. Fac. Design/Krause)
LANTNAVFACENGCOM (Design Dir./Bolton)
SOUTHNAVFACENGCOM (07A/Stehmeyer)
NORTHNAVFACENGCOM (09X/Duffy)
SOUTHWESTNAVFACENGCOM (In-House-Design/Cauthorn)
PACNAVFACENGCOM (406/Takushi, 04/Higashihara)
ENGFLDACT CHESAPEAKE (406/Trechsel)
ENGFLDACT MIDWEST (420/Kang)
ENGFLDACT NORTHWEST (04B/Jones)
ENGFLDACT MEDITERRANEAN (N4/Cook)
COMNAVREG NORTHEAST
COMNAVREG NORTHWEST
PWC PENSACOLA (420/Cristea)
PWC YOKOSUKA (400/Kamimoto)
PWC GREAT LAKES (422/Harmon)
PWC JACKSONVILLE (420/Simes)
PWC NORFOLK (424/Jones/NAVFAC 40K/Craddock)
PWC PEARL HARBOR (421/Kaya)
PWC SAN DIEGO (400/Allison)
PWC WASHINGTON (410/Capozzoli)

Subj: ELEVATOR DESIGN GUIDE, INTERIM TECHNICAL GUIDANCE (ITG)

PWC GUAM (423/Moguel)
CESO (158)
NFESC (ESC 60/Ehret)

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NAVFAC ELEVATOR DESIGN GUIDE

1/10/01

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CHAPTER 1

INTRODUCTION

1-1 Purpose and Scope. This document is intended to reflect Navy policy regarding design and construction of elevators. In addition, these requirements compliment non-governmental standards such as those published by ASME and NFPA. This document has been developed to assist architects and engineers in the proper design of Navy facility elevators. Because elevators are complex multi-disciplined products, guidance is needed to consolidate the Navy elevator criteria and help the architectural and engineering disciplines understand their roles in elevator design.

1-2 Applicability. The requirements of this document apply to all elevators in Navy facilities.

1-3 References. Applicable references are listed in each chapter.

1-4 Content and Format. This guidance is arranged by design disciplines, and within each design discipline the chapter is arranged by the major elevator component. This arrangement serves three purposes; (1) allows easy and ready access to elevator requirements needed by each designer; (2) allows a checklist format for the designer to assure all requirements have been met; (3) allows the designer in charge of the overall facility to understand the roles of each of his architects and engineers by providing a tool for coordination of the design effort.

CHAPTER 2

ARCHITECTURAL
ELEVATOR DESIGN GUIDE

2-1 Design Reference Documents

2-1.1 Design elevator, hoistway, and machine room in accordance with the current versions of the following reference documents:

ADA/ABA - American with Disabilities Act (ADA) Accessibility Guide Lines for Building And Facilities; Architectural Barriers Act (ABA) Accessibility Guide Lines.
ADAAG - American Disabilities Act Accessibility Guide Lines
ASME A17.1, - American Society of Mechanical Engineers Safety Code for Elevators and Escalators.
ASME A17.2.1, - Inspector's Manual for Electric Elevators.
ASME A17.2.2, - Inspector's Manual for Hydraulic Elevators.
ASME A17.2.3, - Inspector's Manual for Escalators.
ASME A17.3, - Safety Code for Existing Elevators and Escalators (For designing changes to existing Elevator/Escalator Systems)
NAVFAC PDPS 94-01 – Barrier Free Design Accessibility Requirements
NEII - National Elevator Industry, Inc. (1992) –Vertical Transportation Standards
NFGS - 14210 - NAVFAC Guide Specifications Section 14210, "Electric Traction Elevators"
NFGS - 14240 - NAVFAC Guide Specifications Section 14240, "Hydraulic Elevators"
NFPA 70 - National Electric Code (NEC)
NFPA 80 - Fire Door and Fire Windows
UBC - Uniform Building Code
UFAS - Uniform Federal Accessibility Standards

2-1.2 The requirements and guidance provided in this Architectural Elevator Design Guide are applicable to both continental United States and overseas projects, however the technical/commercial reference standards (ASME, NEC, ADAAG) listed in this document will be different in Europe.

2-1.3 Sprinkler protection shall not be provided for elevator hoistways, pit, and machine rooms of Italian construction projects. Italian law does not allow sprinklers in these areas.

2-2 General Design Guidance

2-2.1 Consult with the NAVFAC Elevator Program Manager, EFD Elevator Program Manager, or PWC Elevator Inspector during the preliminary design of facilities that include elevators. The Navy elevator experts can be located by using phone numbers and e-mail addresses from Chapter 6 "Specifications Elevator Design Guide."

2-2.2 Type of elevators addressed:

a. Hydraulic

(1) Direct plunger: A car is connected to the top of a single section piston, that moves up and down in a cylinder, which is below ground level. The car moves up when hydraulic fluid is pumped into the cylinder from a reservoir, raising the piston. Hydraulic systems are used primarily in low-rise installations where moderate car speed is required, up to 150 feet per minute. The typical extent of travel is 40 feet (12192 mm), do not exceed a maximum travel length of 44 feet (13411 mm) or a maximum building height of four floors for Navy facilities.

(2) Holeless: The car is connected on each side with a single section piston that moves up and down in a cylinder, which is mounted on top of the pit floor. The car moves up when hydraulic fluid is pumped into the cylinder from a reservoir, raising the piston. Car speed up to 125 feet per minute (38.1 meters per minute) is attained and maximum travel length is 12 feet (3658 mm).

(3) Roped: The car is supported by steel hoist ropes and sheave, which are moved up and down by a holeless single section piston in a cylinder. Car speed up to 150 feet per minute is attained and maximum travel length is 48 feet (14630 mm). The use of roped hydraulic elevators for Navy facilities must be approved by the NAVFAC Elevator Program Manager.

b. Electric Traction

(1) Geared: The car is supported in a hoistway by steel hoist ropes, a sheave, and a counterweight. The car and counterweight ride along vertical guide rails. In a geared machine, the drive sheave is connected to the motor shaft through gears in a gearbox. This equipment is designed for mid-rise applications of five or more floors requiring typical speeds up to 350 feet per minute.

(2) Gearless: The car is supported in a hoistway by steel hoist ropes, sheaves, and a counterweight. The car, counterweight and guide rails operate like those in a geared system. The gearless machine has a motor that connects directly to the shaft of the drive sheave. The equipment is designed for high-rise applications of 10 or more floors requiring typical speeds of 500 or more feet

per minute.

2-2.3 Hydraulic and electric traction elevators utilize controllers to coordinate systems and passenger calls. These elevators utilize either of these two types of controllers:

a. Microprocessor: Computer logic control is the standard for both electric traction and hydraulic elevators.

b. Relay logic: Mechanical electro-magnetic controller relays control the operation of the elevator.

2-2.4 Determine the need for elevators by compliance with the most stringent requirements of the following criteria:

a. NAVFAC PDPS 94-01 which requires facility designs to comply with UFAS and ADAAG, whichever one provide the greatest accessibility. The UFAS and ADAAG documents will be combined and superseded by the ADA/ABA in the near future. The UFAS and ADAAG documents are available at web site http://www.access-board.gov, choose "Publications". The draft ADA/ABA document is available at web site http://www.access-board.gov/ada-aba/guidenprm.htm.

b. Comply with the applicable facility design criteria for the facility building type under design. An example of this kind of criteria is the Military HandBook; MIL-HDBK-1036A, "Bachelor Housing" for Bachelor Quarters.

c. Comply with the Facility Design Program Requirements for the specific project. An example of this kind of requirement is the using Activity's desire to ensure access for persons with disabilities to programs, services and employment. Another example is the using Activity's need for vertical transportation of furniture or equipment.

2-3 Machine Room

2-3.1 Locate hydraulic elevator machine room on the lowest level served by the elevator and directly adjacent to the hoistway. Machine room and hoistway must be on the same side of any building expansion joint.

2-3.2 Provide plans and sections for elevator machine room. Show roof top machine room on elevations and plans for electric traction elevators.

2-3-3 Indicate 2 hour fire rating for floor, walls and ceiling construction. If required, indicate stair access, no ladders.

2-3.4 Machine room door (exiting to the interior of the building) shall be "B" Label, fire rated 1 ½ hour with automatic closure, latching door hardware, panic hardware exit device from interior of room, key operated hardware from outside of room only. Machine room

door shall not contain ventilation louvers or undercuts in excess of NFPA 80, Section 1-11.4 requirements. Provide threshold if floor finish under door is combustible, in accordance with NFPA 80, Section 1-11.2.

2-3.5 There are two types of elevator controllers, microprocessor and relay logic. Microprocessors are typical in most installations. However, if you have a base that is located in a remote location or subject to erratic building power supply, a relay logic controller may be a better choice. Confirm elevator controller type with local Public Works and Base Maintenance Department.

2-3.6 Determine if emergency power is required. Emergency power is usually needed in health care facilities (with bed confinement) or high rise facilities (greater than 75'-0" (22860 mm) from ground floor to highest occupied floor). If emergency power is required, coordinate requirements with the Electrical Engineer (for example, the number of elevators to run on emergency power at the same time).

2-3.7 Most electric traction elevator machines are lifted up the elevator hoistway to gain access to roof top machine rooms during construction. Provide a lifting beam at the top of the machine room to accommodate installation of the elevator machine.

2-3.8 Provide an unobstructed 7'-0" (2133 mm) minimum vertical clearance below all solid items (including the lifting beam for electric traction elevators) throughout the elevator machine room. Provide a maximum machine floor to ceiling height of 12'-0" (3658 mm). Provide a suspended gypsum board or plaster ceiling if a ceiling is required below the structural ceiling.

2-3.9 The machine room design shall contain only equipment related to the elevator operation as required by ASME A17.1.

2-3.10 Pipes, ducts and conduit not related to the elevator system are not allowed to penetrate the machine room.

2-4 Elevator Pit

2-4.1 Indicate pit ladder and hoist way sump pump pit on floor plan of the elevator pit. Locate ladder on hoist way sidewall closest to hoist way door opening. Provide sump pit and sump pumps on all elevators.

2-4.2 Detail sump pit large enough to fully enclose submersible sump pump below hoist way pit floor level. Minimum size of elevator sump pump pit is 1' - 6" (457 mm) wide x 1' – 6"
(457 mm) long x 2'- 0" (609 mm) deep, larger is preferred. Provide fully supported, removable grate cover, flush with elevator hoist way pit floor.

2-4.3 Indicate water stops in the walls and waterproofing for elevator pit floor and walls.

2-4.4 On hydraulic elevators, sprinkler protection is required in the pit of each elevator. Refer to Chapter 7, " Fire Protection Elevator Design Guide" for requirements.

2-5 Elevator Hoistway

2-5.1 Maximum travel length for direct plunger type hydraulic elevator is 44 feet (13411 mm) or a maximum building height of four floors for Navy facilities, whichever is the lesser.

2-5.2 Telescopic hydraulic pistons are not acceptable for Navy facilities. Provide only single section pistons for all hydraulic elevators.

2-5.3 Roped hydraulic elevators for Navy facilities must be approved by the NAVFAC Elevator Program Manager.

2-5.4 Geared electric traction machines should be used for buildings of five or more floors.

2-5.5 Gearless electric traction should be used for buildings of ten floors or more where intensive traffic is anticipated.

2-5.6 The elevator code does not allow anything to be installed in the hoistway not related to the elevator operation.

2-5.7 Pipes, ducts and conduit not related to the elevator system are not allowed to penetrate the hoistway.

2-5.8 Show locations of all support beams required in hoistway. Indicate beams on building sections and details. For multiple elevators in the same hoistway, provide divider beams for guiderail support brackets.

2-5.9 Eliminate all ledges (potential personnel standing locations, etc.) in hoistway construction. Provide details which indicate that all horizontal projections and recesses of 2" (50 mm) or more, have been beveled back to hoistway wall at a 75-degree angle downward from horizontal.

2-5.10 Provide exterior ventilation of hoistway if the elevator exceeds 15 feet (4572 mm) of travel. To obtain this ventilation, provide a weatherproof louver with a minimum free area of 3 1/2 % of the hoistway horizontal cross sectional area. The louver must have a minimum free area of at least three square feet (0.3 square meters).

2-5.11 Detail grouted cast white bronze or nickel silver hoistway sills at elevator landings. Match the material used in the cab sill.

2-5.12 Indicate all elevator hoistway door frames grouted to a height of 5 feet (1524 mm).

2-5.13 On hydraulic elevators, design clear access for hydraulic oil line between machine room and hoistway. Hydraulic oil lines shall remain in or under conditioned space from end to end and remain within the building footprint. Provide straight pipe run in PVC pipe sleeves for oil spill containment of all buried hydraulic lines between machine room and the hoistway.

2-5.14 On hydraulic elevators, sprinkler protection is required at the top of the hoistway when the hydraulic cylinder or supply piping extends above the second finished floor elevation. Refer to Chapter 7, "Fire Protection Elevator Design Guide" for requirements.

2-5.15 Coordinate sprinkler and smoke detector requirements with Fire Protection Engineer and Electrical Engineer. Confirm smoke detectors are shown on fire alarm plans and risers.

2-5.16 For interior cab dimensions of new elevators being installed in an existing hoistway, insure that the design meets the requirements of ASME A17.1. (Rule 201, Capacity and Loading). Passenger elevators frequently require greater capacity (pound per square foot (kilogram per square meter)) than freight elevators.

2-5.17 Indicate 2-hour fire rating for floor, walls, and top of hoistway (when terminated below roof level) construction.

2-5.18 If building roof construction is combustible: Item a. below is considered good practice for 2-hour rated hoistways that terminate at the roof level, item b. below is required for 2-hour rated hoistways that terminate below the roof level.

a. Extend 2 hour rated hoistway through the roof and terminate the top of the hoistway at least 3'-0" (914 mm) above the combustible roof with a 2-hour enclosure, or

b. Terminate the 2-hour rated hoistway below the roof level with a 2-hour rated enclosure.

2-5.19 If building roof construction is noncombustible: comply with one of the following requirements for top termination of the 2 hour rated hoistway.

a. Extend 2 hour rated hoistway construction to the underside of the roof deck or slab. Seal wall construction tight to deck or slab and roof construction becomes hoistway termination, or

b. Terminate the 2-hour rated hoistway below the rated roof level with a 2-hour rated enclosure.

2-5.20 Indicate and note the hoistway walls to be grouted and fire-stopped at top, tight against floor or roof construction decking.

2-5.21 Hoistway walls shall be plumb. Wall shall not vary more than one inch (25 mm) within any 60-foot (18-meter) interval of vertical height.

2-6 Elevator Cab

2-6.1 Obtain manufacturer's catalog cuts of the elevator performance. Coordinate the following elevator description information with the specification writer and appropriate design discipline(s):

a. Rated load
b. Rated speed
c. Travel length
d. Number of stops
e. Number of hoistway openings
f. Car inside dimension
g. Car door opening
h. Electrical design requirements

2-6.2 Coordinate the cab enclosures and hoistway door finishes with the specification writer:

a. Floor finish
b. Wall finish and accessories handrails
c. Interior face of doors
d. Ceiling finish and lighting
e. Hoistway doors
f. Hoistway frames.

2-6.3 The designer and client must decide whether a passenger or freight elevator is most appropriate for the facility. This decision will be based on the anticipated usage. If the elevator will be used to carry people other than a freight handler, it must be designed as a passenger elevator.

2-6.4 Design the size of all elevators that carry passengers to accommodate handicapped access in accordance with UFAS and ADAAG. For all buildings of four stories or more in height, provide at least one elevator of size to accommodate emergency medical services in accordance with UBC, Chapter 30.

2-6.5 Passenger elevator design/selections: The design of passenger elevators requires obtaining and utilizing the appropriate data and criteria to calculate the correct elevator size and rated load.

a. Preliminary design and layout of elevators shall be in accordance with National Elevator Industry, Inc. – Vertical Transportation Standards. Copies of this standard may be obtained from; National Elevator Industry, Inc., 400 Frank W. Burr Blvd., Teaneck, NJ 07666-6801; Telephone: (201) 928-2828.

b. The Final elevator design including the required number of cars, their capacity and car inside dimensions, speed, and operation is to be determined by a traffic study. The following factors will be utilized in this analysis, which should be performed by a qualified elevator consultant.

(1). Type and Use of Building
(2). Size and Height of Building.
(3). Exterior Traffic Consideration
(4). Population of Building
(5). Anticipated Traffic Flow

c. Determine minimum rated load of elevator by utilizing attachment #1: ASME A17.1 Table 207.1.

2-6.6 Freight elevator design/selection: If the elevator will be used to carry passengers and general freight, it must be designed as a passenger elevator. However, if a freight elevator is required, design in accordance with ASME A17.1 (Rule 207. 2 Minimum Rated Load for Freight Elevator).

2-6.7 Provide a cast white bronze or nickel silver car sill. Match the material used in the hoistway sill.

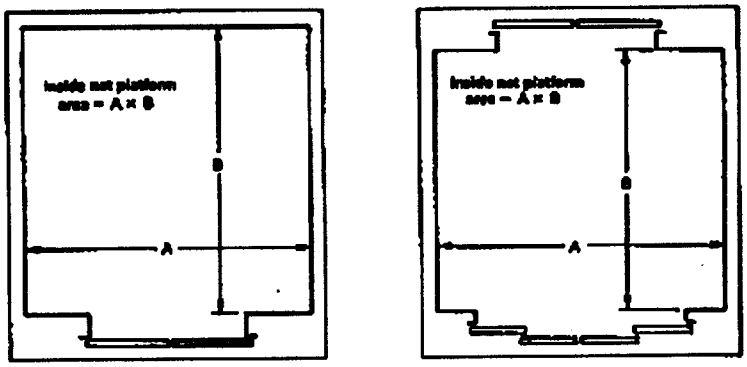

FIG. 207.1 INSIDE NET PLATFORM AREAS FOR PASSENGER ELEVATORS

TABLE 207.1
MAXIMUM* INSIDE NET PLATFORM AREAS FOR THE VARIOUS RATED LOADS

Rated Load, lb	Inside Net Platform Area, ft²	Rated Load, lb	Inside Net Platform Area, ft²
500	7.0	5,000	60.0
600	8.3	6,000	67.7
700	9.6	7,000	85.3
1,000	13.25	8,000	72.9
1,200	15.6	9,000	80.5
1,500	18.9	10,000	88.0
1,800	22.1	12,000	103.0
2,000	24.2	15,000	125.1
2,500	29.1	18,000	146.9
3,000	33.7	20,000	161.2
3,500	38.0	25,000	196.5
4,000	42.2	30,000	231.0
4,500	46.2		

*To allow for variations in cab designs, an increase in the maximum inside net platform area not exceeding 5% shall be permitted for the various rated loads.

GENERAL NOTE:
1 lb = 0.454 kg
1 ft² = 9.29 E −02 m²

Attachment #1

CHAPTER 3

STRUCTURAL ELEVATOR DESIGN GUIDE

3-1 Design Reference Documents

3-1.1 Design elevator, hoistway, and machine room in accordance with the current versions of the following reference documents:

ASCE-7 - America Society of Civil Engineers. Minimum Design Loads for Buildings and Other Structures.

ASME A 17.1, - America Society of Mechanical Engineers Safety Code Elevators and Escalators.

FEMA - 302, February 1999 - NEHRP Recommended Provisions for Seismic. Regulations for New Buildings and Other Structures. Part 1 Provisions.

NFGS - 14210 - NAVFAC Guide Specifications Section 14210, "Electric Traction Elevators"

NFGS - 14240 - NAVFAC Guide Specifications Section 14240, "Hydraulic Elevators"

TI 809-04, 31 December 1998 - TRI-Service Instruction, Seismic Design for Buildings.

3-1.2 The requirements and guidance provided in this Structural Elevator Design Guide are applicable to both continental United States and overseas projects, however the technical/commercial reference standards (ASME) listed in this document will be different in Europe.

3-2 Design Requirements

3-2.1 In all seismicity regions, provide adequate structural support to attach the elements of the elevator support system as required by the elevator manufacturers design and applicable codes. The elevator manufacturers shall design the elements of the elevator support system (all elements that are part of the elevator system, such as the car and counterweight frames, guide rails, supporting brackets and framing, as well as supports and attachments for driving machinery, operating devices, and control equipment) with consideration to lateral seismic forces and displacement of TI 809-04, Paragraph 10-3.h. The elevator shall also comply with the following:

a. Manufacturer shall design all supports and attachments for machinery and equipment with an a_p equal to 1.0 for rigid and rigidly attached items and equal to 2.5 for nonrigid or flexibly mounted equipment.

b. In structures conforming to Seismic Design Classification D, E, and F, the manufacturer shall provide guide rail tie brackets and intermediate spreader brackets as specified in TI 809-04, Paragraph 10-3 h.2.

3-2.2 Avoid the use of tile or brick hoistway walls, particularly those conforming to Seismic Design Classification D, E, and F.

3-2.3 Indicate details for sump pump pit and the impact of the sump pit on the foundation for the structure.

3-2.4 Indicate water stops in the walls. Indicate waterproofing for the elevator pit floor and walls if not indicated on the architectural drawings.

3-2.5 Avoid locating building expansion joints between the elevator hoistway and elevator room.

3-2.6 Design all exterior components of the elevator or machine room to the same requirements used for the facility design. In the absence of structural criteria for the exterior components use ASCE-7.

CHAPTER 4

MECHANICAL
ELEVATOR DESIGN GUIDE

4-1 Design Reference Document

4-1.1 Design elevator, hoistway, and machine room in accordance with the current versions of the following reference documents:

ADAAG - American Disabilities Act Accessibility Guidelines
ASME A17.1, - American Society of Mechanical Engineers Safety Code for Elevators and Escalators.
ASME A17.2.1, - Inspector's Manual for Electric Elevators.
ASME A17.2.2, - Inspector's Manual for Hydraulic Elevators.
ASME A17.2.3, - Inspector's Manual for Escalators.
ASME A17.3, - Safety Code for Existing Elevators and Escalators (For designing changes to existing Elevator/Escalator Systems)
NFGS - 14210 - NAVFAC Guide Specifications Section 14210, "Electric Traction Elevators"
NFGS - 14240 - NAVFAC Guide Specifications Section 14240, "Hydraulic Elevators"
NFPA 70 - National Electric Code (NEC)
NFPA 80 - Fire Door and Fire Windows
UBC - Uniform Building Code
UFAS - Uniform Federal Accessibility Standards

4-1.2 The requirements and guidance provided in this Mechanical Elevator Design Guide are applicable to both continental United States and overseas projects, however the technical/commercial reference standards (ASME, NEC, ADAAG) listed in this document will be different in Europe.

4-1.3 Sprinkler protection shall not be provided for elevators hoistway, pit, and machine rooms of Italian construction projects. Italian law does not allow sprinklers in these areas.

4-2 Machine Room

4-2.1 Indicate ventilation as required by ASME A 17.1 (Rule 101.5, Lighting and Ventilation of Machine Rooms and Machinery Spaces). Provide heating, ventilating, and air-conditioning to elevator machine room to maintain temperature limits between 50 to 90 degrees F (10 to 32 degrees C) as recommended by elevator manufacturers. Air conditioning is required in most conditions; gravity ventilation is not acceptable. Coordinate with Electrical Engineer. Provide emergency power for machine room cooling/ventilating equipment, if the elevator is on emergency power circuit

4-2.2 Do not locate equipment, pipes, conduits, and ducts unrelated to the elevator in the hoistway and the machine room. ASME A17.1 (Rule 101.2, Equipment in Machine Rooms).

4-2.3 Machine room door (exiting to the interior of the facility) shall be fire rated and shall not contain louvers for ventilation nor undercuts in excess of NFPA 80, Section 1-11.4 requirements.

4-3 Elevator Pit

4-3.1 An elevator pit floor drain is not acceptable. Elevator pit must have floor sump pit and pump. Pump to sanitary sewer through a 2" (50 mm) air gap or directly through an oil/water separator to storm sewer, or to grade outside the building line, each in accordance with discharge permits, regulations, and statutes. Coordinate sump pit pump with the Architect, Structural Engineer, and Electrical Engineer.

4-3.2 On hydraulic elevators, sprinkler protection is required in the pit of each elevator. Refer to Chapter 7, "Fire Protection Elevator Design Guide" for requirements.

4-3.3 Size sump pump for a minimum of 20 gallons (76 liters) per minute. Coordinate pump size with Architect to assure the pump will completely fit within the sump pump pit and function correctly.

4-4 Elevator Hoistway

4-4.1 Provide exterior ventilation of hoistway, if the elevator exceeds 15 feet (4572 mm) of travel. To obtain this ventilation, provide a weatherproof louver with a minimum free area of 3 1/2 % of the hoistway horizontal cross sectional area. The louver must have a minimum free area of at least three square feet (0.3 square meters). ASME A17.1 (Rule 100.4, Control of Smoke and Hot Gases).

4-4.2 Pipes, ducts, and conduit not directly related to the elevator are not allowed to penetrate the hoistway.

4-4.3 On hydraulic elevators, sprinkler protection is required at the top of the hoistway when the hydraulic cylinder or supply piping extends above the second finished floor elevation. Refer to Chapter 7, "Fire Protection Elevator Design Guide" for requirements.

CHAPTER 5

ELECTRICAL
ELEVATOR DESIGN GUIDE

5-1 Design Reference Documents

5-1.1 Design elevator, hoistway, and machine room in accordance with the current versions of the following reference documents:

ADAAG - American Disabilities Act Accessibility Guidelines
ASME A17.1, - American Society of Mechanical Engineers Safety Code for Elevators and Escalators.
ASME A17.2.1, - Inspector's Manual for Electric Elevators.
ASME A17.2.2, - Inspector's Manual for Hydraulic Elevators.
ASME A17.2.3, - Inspector's Manual for Escalators.
ASME A17.3, - Safety Code for Existing Elevators and Escalators (For designing changes to existing Elevator/Escalator Systems)
NFGS - 14210 - NAVFAC Guide Specifications Section 14210, "Electric Traction Elevators"
NFGS - 14240 - NAVFAC Guide Specifications Section 14240, "Hydraulic Elevators"
NFPA 70 - National Electric Code (NEC)
NFPA 99 - Health Care Facilities
NFPA 101 - Life Safety Code
UBC - Uniform Building Code
UFAS - Uniform Federal Accessibility Standards

5-1.2 The requirements and guidance provided in this Electrical Elevator Design Guide are applicable to both continental United States and overseas projects, however the technical/commercial reference standards (ASME, NEC, ADAAG) listed in this document will be different in Europe.

5-2 Firefighters' Service Visual Signal

ASME A17.1 requires the Firefighters' Service visual signal to activate as follows: Smoke detectors located in the elevator machine room, hoistway, and elevator lobby control illumination of the Firefighters' Service visual signal (Firefighters' hat graphic symbol) in the elevator cab. When activated, smoke detectors in the elevator machine room and the elevator hoistway shall cause the Firefighters' Service visual signal to illuminate intermittently (flash) only in the elevator car(s) with equipment located in that machine room or hoistway. When activated, smoke detectors in the enclosed elevator lobbies shall cause the Firefighters' Service visual signal to illuminate with steady illumination only in the elevator car(s) that serves those lobbies. Actuation of any smoke detector shall initiate actuation of the building fire alarm panel.

5-3 Machine Room

5-3.1 Provide a shunt trip circuit breaker for each individual elevator's main power and emergency power, if provided, located in the elevator machine room. Circuit breakers shall be capable of being locked in the open position, and shall serve the power and control of the respective elevator. Each shunt trip circuit breaker shall be served by another dedicated breaker in the main distribution electrical panel and in the emergency distribution electrical panel, if provided. Shunt trip breaker(s) shall be operated by the sprinkler flow switch(s) to automatically open the power supply. Power shall be restored manually. NEC 620-51 (a). Sprinkler protection and the related shunt trip breaker shall not be provided for Italian construction projects. Italian law does not allow sprinklers in the hoistway, pit, and machine room.

5-3.2 Designer shall consider types of elevator drives specified, i.e., Silicon Controlled Rectifier (SCR), Variable Frequency Drive (VFD), motor generator, etc., and size service and wire for the worse case.

5-3.3 The guide specification requires the elevator supplier to provide individual isolation transformers and individual choke reactors for each hoist motor, and filtering of harmonic distortion when SCR or Variable Voltage Variable Frequency (VVVF) AC controllers are utilized.

5-3.4 Provide a branch circuit separate from the main elevator power supply, with a fused disconnect switch capable of being locked in the open position, for lights, receptacles, and ventilation for each individual elevator car. As an alternative, a lockable enclosed circuit breaker may be used as the overcurrent protection device. NEC 620-53, NEC 620-22.

5-3.5. Locate all disconnecting means for elevator(s) on the inside surface of the machine room wall next to the strike side of the machine room door. Ensure each disconnect is within sight of the elevator equipment it controls.

5-3.6 A separate branch circuit shall supply each individual machine room with lighting and receptacles.

5-3.7 All 120V receptacles installed in machine room shall be GFI type (Provide at least one duplex receptacle). NEC 620-23 and NEC 620-85.

5-3.8 Conductors and optical fibers, located in the machine room, shall be in conduit.

5-3.9 Coordinate the need for emergency power with the using activity and the project architect. Emergency power is usually needed for health care facilities (with bed confinement) or high-rise facilities (greater than 75'-0" from ground floor to highest occupied floor). Provide emergency power for health care facilities in accordance with NFPA 99, high-rise facilities in accordance with NFPA 101, and other facilities as required.

5-3.10 If emergency power is used:

a. The disconnecting means required by NEC 620-51, must disconnect the elevator from normal power and from emergency power.

b. If more than one elevator is provided, determine (with Activity input) how many elevators are to operate on emergency power.

c. Design the emergency power to be able to operate selected elevator(s) at rated loads and rated speeds.

d. System design must accommodate automatic sequential operation in order to bring all elevators to the designated floor level, as required by ASME A17.1 (Rule 211.3b Smoke Detectors) and provide selected elevator(s) with emergency power operations.

e. Provide manual override switch in main elevator lobby area(s) to override the automatic emergency power selection.

f. Provide emergency power for machine room cooling/ventilation equipment and hoistway ventilating equipment, if the elevator is on emergency power circuit.

g. Provide an extra set of contacts on transfer switch (when emergency power is provided) and two-conductor 120-volt ac circuit in conduit from these contacts to junction box in machine room,

5-3.11 Provide telephone outlet with dedicated line next to each elevator controller for emergency phone service in elevator car. Indicate outlets on telephone riser.

5-3.12 Provide machine room smoke detectors to initiate actuation of Firefighters' Service, illuminate intermittently (flash) Firefighters' Service visual signal, and initiate actuation of the building fire alarm panel. Refer to Chapter 7, "Fire Protection Elevator Design Guide" for requirements. Require smoke detectors to be mounted in the machine room by indicating detectors on the electrical drawings, unless shown on separate fire protection drawings. Coordinate with Fire Protection Engineer.

5-3.13 Only electrical wiring, raceways and cables used directly in connection with the elevator shall be permitted in the machine room. NEC 620-37.

5-4 Elevator Pit

5-4.1 Provide a twist lock simplex receptacle with matching plug, without GFI protection, to supply the permanently installed sump pump. Mount sump pump receptacle 3'-0" (914 mm) above elevator pit floor. Provide pilot lamp to verify circuit is energized. NEC 620-85.

5-4.2 Provide a separate branch circuit supplying the hoistway pit lighting and at least one duplex receptacle in the pit. All duplex receptacles in the pit shall be GFI. NEC-24, NEC 620-85. Locate receptacle 5'-0" (1524 mm) above pit floor.

5-4.3 Locate light with wire guard more than 4'-0" (1219 mm) above pit floor. Locate light switch on wall inside the hoistway adjacent to the top of the pit ladder. NEC 620-24.

5-4.4 When sprinklers are installed in the hoistway, all electrical equipment located less than 4' -0" (1219 mm) above the pit floor shall be weatherproof (NEMA 4) and wiring shall be identified for use in wet locations in accordance with the requirements in NFPA 70.

5-4.5 When sprinklers are provided in the elevator pit, activation of the sprinkler is not required to initiate shutdown of elevator power. Refer to Chapter 7, "Fire Protection. Elevator Design Guide" for requirements.

5-5 Elevator Hoistway

5-5.1 Only electric wiring, raceways, and cables used directly in connection with the elevator shall be permitted inside the hoistway. NEC 620-37.

5-5.2 Conductors and optical fibers located in the hoistway, not including traveling cable, shall be in conduit.

5-5.3 Provide smoke detection at the top of the hoistway whenever sprinklers are installed in the hoistway. If provided, smoke detectors located at the top of the hoistway shall initiate actuation of Firefighters' Service, illuminate intermittently (flash) the Firefighters' Service visual signal, and initiate actuation of the building fire alarm panel. Refer to Chapter 7, "Fire Protection Elevator Design Guide" for requirements. Insure that smoke detectors are indicated on the electrical drawings, unless shown on separate fire protection drawings. Coordinate with Fire Protection Engineer.

5-5.4 When sprinkler protection is required at the top of the hoistway, actuation of that sprinkler(s) shall initiate operation of the elevator power shunt trip breaker(s). Refer to the Machine Room paragraph earlier in this section and to the Chapter 7 "Fire Protection Elevator Design Guide" for further guidance.

5-6 Elevator Lobby

5-6.1 Provide lobby smoke detector to initiate actuation of Firefighters' Service, steady illumination of Firefighters' Service visual signal, and initiate actuation of the building fire alarm panel. Refer to Chapter 7, "Fire Protection Elevator Design Guide" for requirements. Require lobby smoke detectors to be mounted on the ceiling by indicating detectors on the electrical drawings, unless shown on separate fire protection drawings. Coordinate with Fire Protection Engineer.

CHAPTER 6

SPECIFICATIONS
ELEVATOR DESIGN GUIDE

6-1 Design Reference Documents

6-1.1 Design elevator, hoistway, and machine room in accordance with the current version of the following reference documents:

ADAAG –	American Disabilities Act Accessibility Guidelines
ASME A17.1, -	American Society of Mechanical Engineers Safety Code for Elevators and Escalators.
ASME A17.2.1, -	Inspector's Manual for Electric Elevators.
ASME A17.2.2, -	Inspector's Manual for Hydraulic Elevators.
ASME A17.2.3, -	Inspector's Manual for Escalators.
ASME A17.3, -	Safety Code for Existing Elevators and Escalators (For designing changes to existing Elevator/Escalator Systems)
NFGS 14210 -	Electric Traction Elevator
NFGS 14240 -	Hydraulic Elevators
NFPA 70 -	National Electric Code (NEC)
UBC -	Uniform Building Code
UFAS -	Uniform Federal Accessibility Standards

6-1.2 The requirements and guidance provided in this Specifications Elevator Design Guide are applicable to both continental United States and overseas projects, however the technical/commercial reference standards (ASME) listed in this document will be different in Europe.

6-2 Specification Requirements

6-2.1 Utilize the most current version of the NAVFAC Elevator Guide Specifications to specify the project elevator. The NAVFAC Guide Specifications (NFGS) are available on the Construction Criteria Base (CCB) or NAVFAC homepage at http://criteria.navfac.navy.mil/criteria and choose "Guide Specs". Do not use previously edited versions of the guide specification for a new job. Start from the most current version of the guide specifications to assure all updated changes are incorporated in the guide specifications. Any editing of non-bracketed paragraphs within the NAVFAC Guide Specification shall be approved through the NAVFAC Elevator Program.

6-2.2 Incorporate all current LANTDIV Interim Specifications Revisions (ISR) into the prefinal edited project specifications. These ISR changes are available at the LANTDIV homepage at the following address: http://www.efdlant.navfac.navy.mil/lantops_04/home.htm , choose "Specifications", then "The Specification Preparation Manual".

6-2.3 Design/Build RFP documents should utilize the entire current NAVFAC Guide Specification. Do not attempt to abbreviate or write a performance specification for elevators.

6-2.4 If you have any Navy or Local code compliance questions that cannot be answered by in-house expertise or an elevator consultant, contact the NAVFAC Elevator Program Manager or an EFD Elevator Program Manager or a PWC Elevator Inspector for assistance. The NAVFAC Elevator Program Manager, Mr. Kevin Morse (Code 1611K), can be reached by telephone at (757) 322-4653 or by E-mail at MorseKP@efdlant.navfac.navy.mil. The SOUTHWEST Division Elevator Program Manager, Mr. Harold Tompkins, can be reached by telephone at (415) 244-3074, Fax (415) 244-3090. The Norfolk PWC Elevator Inspector, Mr. Dale Hughes, can be reached by telephone at (757) 445-2086 or by E-mail at dhuges@po2.pwc.com. The NAS PAX, Patuxent River, Maryland Elevator Inspector, Mr. Bill Snyder, can be reached by telephone at (301) 757-4902, Fax (301) 342-3700, or by E-mail at snyderwm@navair.navy.mil

6-2.5 Design of elevators is a multidisciplinary design function; therefore, input from architectural, structural, mechanical, and electrical disciplines is required for a successfully written specification or review of the elevator shop drawings.

6-2.6 If difficulties arise from the use of this NAVFAC Elevator Design Guide or the NFGS Sections 14210, "Electric Traction Elevators" or 14240,"Hydraulic Elevator," please contact LANTDIV to make the authors aware of any needed changes in these elevator documents. The point of contact is Mr. Peter Byrne; R. A. (Code 4062) and he can be reached at (757) 322-4310 or by E-mail at BrynePR@efdlant.navfac.navy.mil.

CHAPTER 7

FIRE PROTECTION
ELEVATOR DESIGN GUIDE

7-1 Design Reference Documents

7-1.1 Design elevator, hoistway, and machine room in accordance with the current versions of the following reference documents:

ADAAG -	American Disabilities Act Accessibility Standards
ASME A17.1, -	American Society of Mechanical Engineers Safety Code for Elevators and Escalators.
ASME A17.2.1, -	Inspector's Manual for Electric Elevators.
ASME A17.2.2, -	Inspector's Manual for Hydraulic Elevators.
ASME A17.2.3, -	Inspector's Manual for Escalators.
ASME A17.3, -	Safety Code for Existing Elevators and Escalators (For designing changes to existing Elevator/Escalator Systems)
NFGS - 14210 -	NAVFAC Guide Specifications Section 14210, "Electric Traction Elevators"
NFGS - 14240 -	NAVFAC Guide Specifications Section 14240, "Hydraulic Elevators"
NFPA 13 -	Standard for the Installation of Sprinkler Systems
NFPA 70 -	National Electric Code (NEC)
UBC -	Uniform Building Code
UFAS -	Uniform Federal Accessibility Standards

7-1.2 The requirements and guidance provided in this Fire Protection Elevator Design Guide are applicable to both continental United States and overseas projects, however the technical/commercial reference standards (ASME, NEC, ADAAG) listed in this document will be different in Europe.

7-1.3 Sprinkler protection shall not be provided for elevators hoistway, pit, and machine rooms of Italian construction projects. Italian law does not allow sprinklers in these areas.

7-2 Design Requirements

7-2.1 Provide dual-contact smoke detectors or addressable fire alarm system smoke detectors and control modules at:

a. All elevator lobbies.
b. Top of the hoistway. (Only if sprinklers are provided at the top of the hoistway).
c. Elevator machine room.

Smoke detectors are specified in Section 13852, "Interior Fire Detection and Alarm System," or Section 13855, "Analog/Addressable Interior Fire Alarm System," including conduit and wiring from each smoke detector to elevator controller. In elevator section, provide connections to elevator controls, which will, when smoke is detected by any smoke detector, activate visual and audible signals and send each elevator to the designated floor as required by ASME A17.1 (Rule 211.3b, Smoke Detectors). Indicate detectors and connections on fire protection drawings or on electrical drawings if fire protection drawings are not provided. Coordinate with Electrical Engineer.

7-2.2 For electric traction elevator with 2-hour fire rated hoistway, sprinkler(s) are not required by code for the hoistway. Sprinklers are required in the electric traction elevator machine room (except in Italy). Actuation of the flow switch shall remove power to the elevator by shunt trip breaker operation. The flow switch shall have no time delay.

7-2.3 In buildings protected with an automatic sprinkler system, provide protection of hydraulic elevator installations as follows (except in Italy):

a. Machine Room: Provide a sprinkler(s) with sprinkler guards in the machine room. Provide a supervised shut-off valve, check valve, flow switch, and test valve in the sprinkler line supplying the machine room. These items shall be located outside of and adjacent to the machine room. Actuation of the flow switch shall remove power to the elevator by shunt trip breaker operation. The flow switch shall have no time delay. Coordinate with Electrical Engineer.

b. Elevator Pit: Provide a sidewall sprinkler(s) with sprinkler guards in the pit for hydraulic elevators. Locate the sprinkler no more than 2'-0" (609 mm) above the pit floor. Provide a supervised shut-off valve in the sprinkler line supplying the pit. Locate the valve outside of and adjacent to the pit. Actuation of the pit sprinkler shall not disconnect power to the elevator.

c. Elevator Hoistway: Provide a sprinkler(s) at the top of the hoistway for hydraulic elevators with cylinder or supply piping extending above the second finished floor elevation. Provide a supervised shut-off valve, check valve, flow switch, and test valve in the sprinkler line supplying the hoistway. These items shall be located outside of and adjacent to the hoistway. Actuation of the flow switch shall disconnect power to the elevator by shunt trip breaker operation. Flow switch shall have no time delay. Coordinate with Electrical Engineer.

d. Test Valve: Provide inspector's test connection for each flow switch associated with the elevator machine room and/or elevator hoistway sprinklers. Locate the test connection outside the rated enclosure. Route test connection piping to a floor drain location that can accept full flow or where water may be discharged without property damage. Discharge to a floor drain shall be permitted only if the drain is sized to accommodate full flow. Discharge to janitor sinks or similar plumbing fixtures is not permitted.

7-2.4 Coordinate the requirements of the elevator specification section with the applicable fire protection systems specifications as listed below:

a. Section 13852, "Interior Fire Detection and Alarm System"
b. Section 13855, "Analog/Addressable Interior Fire Alarm System"
c. Section 13930, "Wet-Pipe Fire Suppression Sprinklers"
d. Section 16402. "Interior Distribution System"

7-3 Fire Resistant Construction

7-3.1 Coordinate 2 hours fire resistant construction requirements with Chapter Two, "Architectural Elevator Design Guide."

7-4 Fire Protection Requirement Summary

7-4.1 A summary of the NAVFAC Sprinkler and Smoke Detector requirements are attached in table titled 7-4.1, "NAVFAC Fire Protection Requirements for Elevators Summary Table."

7-4.1 NAVFAC ELEVATOR FIRE PROTECTION REQUIREMENTS SUMMARY TABLE

ELECTRIC ELEVATOR		
ROOM/AREA	PROVIDE SPRINKLER (NOT APPLICABLE FOR UNSPRINKLERED BUILDING)	PROVIDE SMOKE DETECTOR TO INITIATE ELEVATOR FIREFIGHTER'S SERVICE AND BUILDING FIRE ALARM SYSTEM
PENTHOUSE MACHINE ROOM	YES *	YES
ELEVATOR LOBBIES	YES	YES
PIT AREA	NO	NO
TOP OF HOISTWAY	NO **	NO **

DIRECT PLUNGER HYDRAULIC ELEVATOR (NOT TO EXCEED 44' OF TRAVEL)		
MACHINE ROOM	YES *	YES
ELEVATOR LOBBIES	YES	YES
PIT AREA	YES *	NO
TOP OF HOISTWAY	NO **	NO **

HOLELESS HYDRAULIC ELEVATOR (NOT TO EXCEED 12' OF TRAVEL)		
MACHINE ROOM	YES *	YES
ELEVATOR LOBBIES	YES	YES
PIT AREA	YES *	NO
TOP OF HOISTWAY	YES *	YES

* Italian law prohibits sprinklers in elevator hoistway and machine room.

** Provide sprinklers and smoke detector where existing hoistway walls are not 2 hour rated, or existing elevator cab does not meet flame spread or smoke development requirements of ASME A17.1. This situation may occur in historical building renovations.

DEPARTMENT OF THE NAVY
COMMANDER
NAVAL COMPUTER AND TELECOMMUNICATIONS COMMAND
WASHINGTON DC 20394-5460

In reply refer
4000
Ser N44D/ 3116
OCT 23 1993

From: Commander, Naval Computer and Telecommunications Command

subj : COMMUNICATIONS SYSTEMS CABLING

Encl: (1) Memorandum of Understanding (MOU) between U.S. Naval Computer and Telecommunications Command and U.S. Naval Facilities Engineering Command

1. The enclosed MOU is provided to assist you in the planning and programming of any construction or other project with a base communications system requirement., The MOU establishes a more efficient and cost-effective way of providing the user with a usable facility that includes all the required communications infrastructure (including cabling but excluding telephone instruments and equipment).

2. Starting in FY96, the Military Construction (MILCON) or other Navy-funded project will pay for communications systems cabling design, and will permit inclusion of building interior cable installation in the construction contract (previously requiring a separate OPN funded contract).

3. Request you ensure all project documentation includes the base communications systems requirements and costs as outlined in enclosure (1). Request you review and revise existing project documentation as needed for FY96 projects to reflect the provisions of the MOU, thus ensuring you will be provided with a fully functioning usable facility.

4. The Naval Computer and Telecommunications Command point of contact is Mr. Luis Castro, Code N44C, at telephone numbers commercial (202) 282 2509 and DSN 292-2509.

S.A. MOHSBERG II
BY DIRECTION

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NAVCOMTEISTA Key West
NAVCOMTELSTA London
NAVCOMTELSTA New Orleans

Attachment

MEMORANDUM OF UNDERSTANDING

BETWEEN

U.S. NAVAL FACILITIES ENGINEERING COMMAND

U.S. NAVAL COMPUTER AND TELECOMMUNICATIONS COMMAND

1. Authority: OPNAVINST 4000.84

2. Purpose: This Memorandum of Understanding (MOU) establishes a means of doing business that ensures cost-effective, efficient design, procurement, and installation of base communications systems in newly constructed or renovated buildings while avoiding building occupancy delays because of a lack of adequate communications.

3. Scope. This agreement defines the responsibilities and working relationships between the Naval Facilities Engineering Command (NAVFACENGCOM) and the Naval Computer and Telecommunications Command (NAVCOMTELCOM) and their respective field offices in providing base communications systems installed as an integral part of Military Construction, Navy (MCON) or Minor Construction Projects funded with MCON; RDT&E; DBOF; O&M,N; O&M,NR; O&M,MCR (other Navy funded).

4. Responsibilities:

a. NAVCOMTELCOM will:

(1) Provide all policy guidance and direction relating to base communications systems and approve the base communications design portions of MCON and other Navy funded construction projects.

(2) Respond to NAVFACENGCOM and customer requests for assistance in determining base communications requirements and proposing solutions to those requirements by:

(a) Providing and revising, as necessary, a guide specification for inside building wiring.

(b) Reviewing requirements and providing cost estimates for all base communications equipment or services required.

(c) Refining/providing specific requirements, as requested, to drive base communications planning and design efforts at any phase of a project.

(d) Reviewing design parameters, actual specifications when available, or any other project documentation to determine the effect on current base communications infrastructure (e.g., base cable plant and switching systems). This includes, but is not limited to, validating/revising:

(i) Proposed building feeder cable from the base backbone cable system, inside building wiring scheme, and the interface between them for sufficiency.

(ii) Proposed building distribution cable consisting of horizontal cable (i.e., cable running from a floor wire closet to a user's jack on the wall or telephone instrument) and vertical cable (i.e., cable running from an intermediate distribution frame to the wire closets on the floors) for appropriate choice of size and type (e.g., copper, coaxial, fiber) for adequacy.

(iii) Proposed ancillary equipment (e.g., fiber optic terminals, line conditioning, channelization, backup power, etc.) for completeness.

(iv) Proposed space allocation, electrical supply, and environmental controls for base communications switches, terminal equipment, operator consoles, cable vaults, desktop base communications equipment, floor wiring closets, intermediate distribution frames, etc. for sufficiency.

(e) Assisting the project sponsor and any tenant activities in determining actual equipment or service requirements not included in the scope of a MCON or other Navy funded construction project, and in acquiring the equipment or services necessary to fulfill those requirements. This includes, but is not limited to, ordering dial tone, special circuits, and telephone instruments.

(f) Providing a Site Specific Statement of Work (SSSOW) for inclusion into the MCON or other Navy funded construction project involving the procurement of a new base communications switching system and/or total replacement, or extensive modernization of the base cable plant. Additionally, provide these follow-on efforts, as requested:

(i) Provide technical support during the contracting process to answer questions concerning the SSSOW.

(ii) Act as assistant contracting officer's technical representative (ACOTR) for the base communications part of the project.

(iii) Participate in source selection panels.

(iv) Supporting the requiring agency in obtaining any Life Cycle Management (LCM) or other automatic data processing (ADP) equipment approval required in support of the base communications portion of the MCON and other Navy funded construction projects.

(g) Attend project/contracting review conference and site surveys when requested.

(h) Include in NAVCOMTELCOM's base communications procurement packages incidental site preparation (i.e., minor construction), having a direct association with the base communications equipment installation (i.e., customizing a space to meet the specific needs of the base communications contractor). The authority shall not exceed 10% of the total project contract or $300K, whichever is less. Concurrence/approval shall be received from the appropriate NAVFACENGCOM office at each major milestone decision.

b. NAVFACENGCOM will:

(1) Forward MCON and other Navy funded construction projects documentation for which a base communications requirements/design review is needed to the appropriate NAVCOMTELCOM regional office.

Documentation for construction projects in the Metropolitan Washington, D.C. area that are served by Defense Telecommunications Service-Washington (DTS-W) shall also be forwarded to DTS-W for review.

(2) For MCON funded projects: design and contract for projects to include cable and ducting to interface with the base backbone cable distribution system, conduit, raceway, support structure, base communication closets, switch/equipment rooms, feeder cable (i.e., fiber and/or copper), and inside building distribution cable (i.e., fiber and/or copper) to support base communication systems. When fiber optic feeder cable is to be installed, ensure the appropriate fiber optic and channelization terminal equipment is included in the contract. If bare base, include provisions for all base communications to include the telephone switch and the base distribution backbone cable plant.

(3) Insure cost of cabling is included in MCON projects.

(4) For non-MCON funded projects: design and contract for construction projects to include all cable/hardware and ancillary equipment that is requested and funded by the customer.

(5) Provide to NAVCOMTELCOM's appropriate regional office the Project Engineering Phase and the 100% design plans for review and comments to confirm appropriate space, conduit, ducts, cabling, and electrical services for the base communications systems have been provided in accordance with earlier reviews/revisions.

(6) Have the appropriate public works office or cognizant NAVFACENGCOM office approve all minor construction requirements (i.e., see paragraph 4.h), validate offerors' proposals ensuring compliance with all NAVFACENGCOM design standards, and act as a consultant during actual construction.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
1510 GILBERT ST
NORFOLK, VA 23511-2699

IN REPLY REFER TO:
11012
04C/cmm
31 MAY 1994

From: Commander, Naval Facilities Engineering Command (Code 15C)
To: Distribution

Subj: CATHODIC PROTECTION SYSTEMS, INTERIM TECHNICAL GUIDANCE

Ref: (a) DPL-90-0006, Cathodic Protection Systems, Policy Guide
(b) CFR Title 49 Chapter 1, Part 192, Transportation of Natural and Other Gas by Pipeline; and Part 195, Transportation of Liquids by Pipeline
(c) CFR Title 40 Part 280, Technical Standards and Corrective Action for Owners and Operators of Underground Storage Tanks
(d) MIL-HDBK-1004/10, Electrical Engineering, Cathodic Protection
(e) NAVFAC MO-306, Maintenance and Operation of Cathodic Protection Systems
(f) NAVFACINST 11014.52

Encl: (1) Interim Design Criteria for Cathodic Protection Systems
(2) EFD Points of Contact for Corrosion Control, October 93

1. Purpose: To provide interim technical guidance for the use of cathodic protection systems (CPS) in shore utility systems and facilities. The guidance can be retained for record purposes until it is incorporated in the criteria noted in paragraph 4.d. This guidance supersedes and cancels reference (a).

2. Background: CPS reduce corrosion of buried or submerged metallic structures and utility systems, thus reducing the probability of failure with concomitant environmental, operational, safety and economic repercussions. Environmental laws prohibit the leakage of hazardous material into the environment. Additionally, the Navy spends millions of dollars annually repairing and replacing corroded metallic utility systems and structures that are unprotected by CPS. References (b) and (c) require the installation of CPS on certain buried or submerged steel gas, fuel and other hazardous material pipelines and storage facilities. However, in many cases CPS are not considered in the planning or design of such systems. Structures in corrosive environments also benefit from the installation of CPS, but are rarely considered for such protection. Some rehabilitation applications such as driving new sheet piling outboard of existing deteriorated piling, may result in the new sheet piling being anodic to the old and thus accelerating corrosion of the new sheet piling. Other similar rehabilitation projects may also incur a risk that repairs will accelerate corrosion. Finally, some NFGS guide specification sections currently do not adequately specify CPS requirements.

Attachment

3. Technical Guidance: Provide corrosion protection measures on all new and existing buried or submerged metallic utility systems and metallic waterfront structures as described in enclosure (1). The overall corrosion protection system shall include cathodic protection systems, coatings, material thickness incrementation, encasement, or other methods as required by enclosure (1). Consult with the NAVFAC Criteria Office, Code 15C, or the cognizant EFD/EFA Corrosion Control Coordinator listed in enclosure (2) prior to deviating from this guidance.

4. Action:

a. Planning. Include CPS requirements as a separate line item in cost estimates and planning documentation for the construction of new or the repair/upgrade of existing metallic utility systems and metallic structures described above. Include CPS narratives and cost estimates on DD Form 1391 under supporting utilities. Coordinate CPS requirements with the activity corrosion control plan to establish and ensure compatibility with existing systems. The cognizant EFD Corrosion Control Coordinator can assist in determining the system requirements.

b. Design. Navy engineers and architects in charge of design (AIC/EIC): ensure that project designs include CPS where required and appropriate, and comply with reference (d), enclosure (1) and other applicable Military Handbooks and Design Manuals including specifications for CPS in NFGS-16641 or NFGS-16642 as applicable; refer to NFGS-16641 or NFGS-16642 as applicable in specifications that reference CPS (e.g., NFGS-02682 and NFGS-02694); in designs prepared for the Air Force, comply with the current Air Force CPS Engineering Technical Letter (ETL) and coordinate with the Air Force Base Corrosion Engineer.

c. Construction. The Navy Officer in Charge of Construction and Resident Officer in Charge of Construction (OICC/ROICC): perform CPS construction inspections and ensure as-built drawings provide locations of all CPS equipment, test stations, insulating fittings, etc.; supervise the acceptance tests of the CPS to ensure the tests comply with procedures specified in the contract documents. In the absence of a qualified CPS inspector, obtain assistance from the EFD corrosion control coordinator, see enclosure (2).

d. Criteria. The NAVFAC Criteria Office: coordinate the revision of the following criteria to incorporate the CPS interim technical guidance:

MIL-HDBK-1025/1, Piers and Wharves
MIL-HDBK-1025/2, Dockside Utilities for Ship Service
MIL-HDBK-1025/6, General Criteria Waterfront Construction
MIL-HDBK-100211, Structural Engineering, General Requirements
MIL-HDBK-1002/3, Structural Engineering, Steel Structures

MIL-HDBK-1003/8A, Exterior Distribution of Utility Steam, High Temperature Water, Chilled Water, Natural Gas
MIL-HDBK-1004/10, Cathodic Protection
Design Manual 7.2, Foundations and Earth Structures
Design Manual 22, Petroleum Fuel Facility
NFGS-01730, Operation Maintenance Data
NFGS-02368, Rolled Steel Section Piles
NFGS-02366, Sheet Steel Piles
NFGS-02666, Exterior Water Distribution
NFGS-02661, Exterior Water Distribution Minor Construction
NFGS-02682C, Exterior Fuel Distribution
NFGS-02685, Gas Distribution System
NFGS-02694, Exterior Underground Heat System
NFGS-02697B, Exterior Buried Pumped Condensate Return
NFGS-02698, Exterior Buried Preinsulated Water Piping
NFGS-13209, Water Storage Tank
NFGS-13216, Underground Petroleum Tanks
NFGS-15486, Aviation Fuel Distribution and Dispensary
NFGS-15488, LP Compressed Air System
NFGS-15489, BP Compressed Air System
NFGS-15492, Fuel Gas Piping
NFGS-15511, Low Temperature Water
NFGS-16641, Cathodic Protection
NFGS-16643, Water Tanks

e. Operation and Maintenance. Perform maintenance according to references (e) and (f), CPS Operation and Maintenance Support Information (OMSI) Manuals and cognizant EFD requirements.

f. Training. The National Association of Corrosion Engineers (NACE), various academic institutions, and the various services offer CPS design and inspection courses. Contact the cognizant EFD Corrosion Control Coordinator for recommended training courses.

5. Points of Contact: For additional information concerning design criteria, please contact Mr. Charles Mandeville, P.E., Electrical Engineering Criteria Manager, NAVFACENGCOM Code 15C, at DSN 564-9599 or commercial (804) 444-9599. For additional information concerning maintenance criteria, please contact Mr. Bruce Bell, NAVFACENGCOM, Code 1334, at DSN 221-0046 or commercial (703) 325-0046. The technical point of contact for

31 MAY 1994

Subj: CATHODIC PROTECTION SYSTEMS, INTERIM TECHNICAL GUIDANCE

CPS is Mr. Tom Tehada, PACNAVFACENGCOM, Code 1621A. He can be reached at DSN 312-5949 or commercial (808) 474-5360.

P. N. Bolton

P. N. BOLTON
By direction

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INTERIM DESIGN CRITERIA
EM
CATHODIC PROTECTION SYSTEMS
April 1994

1. Provide Cathodic Protection Systems (CPS) and protective coatings for the following buried or submerged metallic utility systems regardless of soil or water corrosivity:

a. Natural gas pipelines
b. Petroleum, Oil and Lubricant (POL) pipelines
c. Oxygen pipelines
d. Underground POL and gasoline storage tanks
e. Underground hazardous substance storage tanks
f. All water storage tanks interiors

2. Consider CPS in conjunction with other protective measures such as material thickness incrementation, protective coatings and encasement for the following waterfront metallic structural systems:

a. Steel sheet piling bulkheads
b. Steel bearing piles for piers
C. Steel fender piles for piers
d. Mooring Components

In marine environments, CPS are most effective and can greatly extend the life of the submerged zones of steel waterfront structures. The splash and atmospheric zones will require reapplication of coatings and encasements for maximum system service life. Partial concrete encasement of steel piles creates a zone of high potential at the concrete encasement-to-bare steel pile interface where submerged. CPS should be provided in these circumstances in addition to the partial encasement

3. Install CPS for the exterior bottoms of steel above ground POL storage tanks (AST) with or without impervious liners unless field tests and inspections by a qualified corrosion engineer indicate the environment to be non-corrosive. Existing tanks with bottoms on oil-filled sand pads on plastic liners are not necessary. However, when these tank bottoms are replaced, provide CPS unless field tests and inspections by a qualified corrosion engineer indicate the environment to be non-corrosive.

4. Provide CPS and bonded protective coatings on other buried or submerged new steel, ductile iron, or cast iron utility pipelines not mentioned above when the resistivity is below 30,000 ohms at the installation depth at any point along the installation. Do not use unbonded protective coatings such as loose polyethylene wraps. Provide joint bonding on all ductile iron and cast iron installations.

Enclosure (1)

5. Economic feasibility of providing CPS shall be evaluated for the following buried or submerged systems:

a. Gravity sewer lines, force mains
b. Existing steel waterfront structures
c. Reinforcing steel in concrete
d. Cast/ductile iron potable water lines in soils with resistivities greater than 30,000 ohm-cm along its entire length
e. Concentric neutral cable
f. Below ground hydraulic elevator cylinders
g. All buried or submerged metallic structures not mentioned above.

Implementation of CPS on these systems shall be based on life-cycle economics. The requirements for CPS shall be determined by the corrosion engineer.

6. When rehabilitating existing steel sheet pile bulkheads by driving new sheets outboard of the existing, include the following requirements for the CPS:

a. Electrically isolate new piling from old piling.
b. Electrically isolate tie rods from existing sheet piling by cutting a hole in the old pile and providing a dielectric sleeve through the pile.
c. Coat tie rods and new piling on all sides.
d. Consider CPS as part of the total corrosion protection system. Use conventional soil side anodes to protect the seaside and landside of the pile and to protect the tie rods if field tests indicate this to be feasible. Otherwise, consider using a deep anode bed system. Waterside anodes are appropriate only in areas not subject to maintenance dredging, water turbulence from ship/boat traffic, normal or storm generated heavy wave action, or constant movement of the sea bottom. Conduct a site survey to determine the appropriate anode configuration and cathodic protection system requirements.

7. CPS shall provide protective potentials according to the requirements of the National Association of Corrosion Engineer (NACE) Standard RP01-69 (latest revision), Control of External Corrosion on Underground or Submerged Metallic Piping Systems and NACE Standard RP02-85 (latest revision), Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems.

8. Architect-Engineer (A-E) CPS surveys and designs shall be accomplished under the supervision of one of the following individuals:

a. Registered Professional Corrosion Engineer
b. Registered Professional Engineer who is also a NACE certified corrosion protection specialist or cathodic protection specialist or has a minimum of five years of experience in the applicable CPS

c. NACE certified corrosion protection specialist or cathodic protection specialist with a minimum of five years experience in the applicable CPS.

CPS surveys or designs accomplished by Navy in-house design personnel need not comply with paragraphs 8.a through 8.c above, but shall be reviewed by the cognizant EFD Code 16 Corrosion Control (C2) Coordinator or PACNAVFACENGCOM Code 1621 A.

9. Perform field tests (resistivity, pH, current requirements, etc.) at the proposed installation to evaluate, as a minimum, soil and/or water corrosivity. The tests shall be used to design the CPS and assumptions shall be supported by the field test data.

10. Design submittals shall include as a minimum the following:

a. PEP - soil and/or water corrosivity data, current requirement test data (if applicable), and all design calculations.
b. Final drawings - CPS one line diagrams, locations of all Cathodic Protection equipment (Anodes, rectifiers, test stations, etc.), interference test points, installation details, insulating fittings, and bond connections.
c. Final specifications - acceptance testing procedures including static (native) potentials, initial and final system potentials, and interference tests.

Project Managers shall contact the EFD Corrosion Control Coordinator regarding the CPS design at the pre-final project phase and, upon request, shall forward the design documents to the Coordinator for review.

11. CPS shall be compatible with existing systems. When plastic pipe is selected to replace or extend existing pipe, thermal weld an insulated No. 8 AWG copper wire to the existing steel pipe and ran the full length of the plastic pipe for continuity and locator tracing purposes.

12. Design CPS for overall system maintainability.

EFD POINTS OF CONTACT FOR CORROSION CONTROL
MAY 1994

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Mr. Dave Jutton Code 1614E	(804) 322-4650 DSN 565-4650 FAX (804) 322-4615	LANTNAVFACENGCOM 1510 Gilbert Street Norfolk, VA 23511-2699	L
Mr. Tom Tehada/ Mr. Joel Young Code 1621A	(808) 471-5949/5360 (808) 474-5949/5360 FAX (808) 474-5407	PACNAVFACENGCOM Pearl Harbor, HI 96860-7300	P
Mr. Jess Novero Code T2B2JN	(415) 244-3583 DSN 494-3583 FAX (415) 244-3511	WESTNAVFACENGCOM 900 Commodore Drive San Bruno, CA 94066-2402	W
Mr. Ron Shatz Code 09TB/RS	(215) 595-0524 DSN 443-0524 FAX (215) 595-0535	NORTHNAVFACENGCOM 10 Industrial Highway Mail Stop #82 Lester, PA 19113-2090	N
Mr. Ray Caniglia Code 1621RC Mr. Eddie Piedmont Code 1621EP	(803) 743-0625/0623 DSN 563-0625/0623 FAX (803) 743-0563	SOUTHNAVFACENGCOM P. O. Box 190010 North Charleston, SC 29419-9010	S
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Mr. Dan Polly	(805) 982-1058 DSN 551-1058 FAX (805) 982-1418/1409	NFESC 560 Center Drive Port Hueneme, CA 93043-4322	
Mr. Barry W. Kollme	(618) 256-3067 DSN 576-3067	HQ Military Airlift Command DCS/Engineering and Services HQ MAC/DEMU Scott AFB, IL 62225-5001	

Facility Assessment - Antiterrorism/Force Protection Threat Questionnaire Cover Sheet

Refer to ***Interim Department of Defense Antiterrorism/Force Protection Construction Standards dated 16 December 1999*** for additional information in filling out this form for the proposed project, and for the tables (AP3.T1, etc.) and paragraphs (DL1.1.11, AP2.1.3.2, etc.) referenced throughout the document.

The information in this questionnaire will be used to determine funding added to the project to support Antiterrorism/Force Protection (AT/FP) modifications to the structure and/or to the supporting facilities.

Definitions:

1. **Inhabited Structure** (DL1.1.11) - a structure intended to be occupied by DoD personnel with a personnel density of greater than one person per 400 square feet.
2. **Primary Gathering Structure** (DL1.1.21) - an inhabited structure where 50 or more DoD personnel routinely gather, such as an office building or indoor recreation facility.
3. **Troop Billeting Structure** (DL1.1.27) - an inhabited structure where DoD personnel are billeted (I.e., BQs, transient lodges, etc.). This does not include military family housing.
4. **Facility Standoff Distances** are intended to prevent the progressive collapse of structures.
   a. The standoff distance (AP1.2.1.1) is the distance from the face of the project structure (at any point) to the point on the site at which one can effectively establish a perimeter within which one can control vehicle access. The standoff distance should be maintained by barriers on the perimeter of the standoff zone.
   b. For parking lots and roadways the standoff distance (AP2.2.2) is measured from the nearest edge of the pavement to the project structure.
5. **Active Vehicle Barrier** (DL1.1.1) - a vehicle barrier which must be manually or automatically deployed in response to detection of a threat.
6. **Passive Vehicle Barrier** (DL1.1.17) - a perimeter barrier that serves the function of arresting or impeding vehicular movement and that is non-movable.
7. **Perimeter Barrier** (DL1.1.18) - a fence, wall, passive vehicle barrier, landform, or line of vegetation applied along an exterior perimeter used to obscure vision, hinder personnel access, or hinder or prevent vehicle access.
8. **Threat Severity Level** (DL1.1.28) - levels within each tactic corresponding to different sets of tools, weapons, and explosives. The severity of effects increases with increasing threat security levels.
9. **Levels of Protection** (AP3.2.1.3 and Table AP3.T2) - different levels of damage to inhabited structures and injury to occupants. Minimum level of protection for a specific bomb threat means the structure will sustain significant damage without progressive structural collapse; majority of occupants will suffer serious injuries (about 85%) along with a limited number of fatalities (about 15%).

Antiterrorism/Force Protection Threat Questionnaire

Project Number: _____ Building Name/Number: _____

Project Name: _____ Building Cat Code: _____

Activity Name: _____ Cat Code Description: _____

(**Note** - If required, attach additional forms for other buildings in the project with threat assessments different from the one listed on this sheet.)

A. **Exclusions:** The Interim DoD Standard generally excludes industrial and storage facilities, and does not include guard facilities and detached family housing (DL1.1.11).

B. **Design Threat Plan:** The following table is shown for information and lists the standard threat parameters outlined in Table AP3.T1.

Threat Parameters			
Tactic	**Threat Severity Level**	**Weapon**	**Tool**
Vehicle Bomb, Moving and Stationary	Special Case	20,000 pounds TNT	60,000 pound truck
	High	1,000 pounds TNT	5,000 pound truck
	Medium	*500 pounds TNT*	4,000 pound car
	Low	220 pounds TNT	4,000 pound car
	Minimum	50 pounds TNT	4,000 pound car
Placed Bomb		50 pounds TNT	
Mail Bomb		2 pounds TNT	
Ballistics	Very High	7.62 mm Armor Piercing	
	High	7.62 mm	
	Medium	.44 Magnum	
	Low	.38 Special	

NOTE: Any threat severity level and level of protection checked off as above"MINIMUM" or "NONE" must be substantiated to PACOM per PACOM OPORD 5050.

C. **Standoff Distance:** Fill in the following table based on the projected location of the proposed structure.

Type of Standoff	Indicate Actual Available Standoff Distance (feet)	
Distance from Inhabited Structure to perimeter. *See item (1).*		AP2.1.3.1
Distance from BQs/Primary Gathering Structures to perimeter. *See item(2).*		AP2.1.3.2
Distance from Structure to Parking Lots or Roadways. *See items (3) & (4).*		AP2.1.3.3, AP2.1.3.4, AP2.2.2
Distance from Structure to other structures. *See item (5).*		AP2.1.3.5

1) The Min. Standoff Distance from Inhabited Structures to the perimeter controlling vehicle/personnel access is 80 feet; otherwise, additional costs are incurred.

2) The Min. Standoff Distance from BQs/Primary Gathering Structures to the perimeter controlling vehicle and personnel access is 150 feet; otherwise, additional costs are incurred.

3) The Min. Standoff Distance from Inhabited Structures to parking lots, roadways, or trash containers is 30 feet; otherwise, additional costs are incurred.

4) The Min. Standoff Distance from Troop Billeting or Primary Gathering Structures to parking lots, roadways, or trash containers is 80 feet; otherwise, additional costs are incurred.

5) The Min. Building Separation Distance from BQs/Primary Gathering Structures to other structures is 50 feet; otherwise, additional costs are incurred.

D. **Bomb/Ballistic Threat Levels:** Check the applicable blocks. (If "None" is checked, it indicates that no threat is anticipated, and no other items within that column should be checked.)

Bomb Threat		Check Block
Bomb *Threat Severity Level*, see Table AP3.T1	None	
	Minimum	
	Low	
	Medium	
	High	

Ballistic Threat		Check Block
Ballistic *Threat Severity Level*, see Table AP3.T1, AP1.4	None	
	Low	
	Medium	
	High	
	Very High	

E. **Moving Vehicle Threat Levels:** Check the applicable blocks to select the preferred types of barriers and their deterrence ratings. (If "None" is checked, it indicates that no threat is anticipated, and no other items within that sub-section should be checked. Refer to section B for more details.)

Moving Vehicle Threat Protection Required		Check Block
Passive Vehicle Barrier as Deterrent		
None		
Bomber Vehicle Weight, see Tables AP3.T1 & AP4.T21	4,000-pounds car	
	5,000-pounds truck	
	15,000-pounds truck	
	60,000-pounds truck	
Barrier Rating, see Table AP4.T21	High	
	Low to Medium	
	Non-rated	
Active Vehicle Barrier as Deterrent		
None		
Bomber Vehicle Weight, see Tables AP3.T1 & AP4.T22	4,000-pounds car	
	5,000-pounds truck	
	15,000-pounds truck	
	60,000-pounds truck	
Barrier Rating, see Table AP4.T22	High	
	Low to Medium	
	Non-rated	

F. **Levels of Protection:** Check off the *Level Of Protection* required for the project. A balance needs to be maintained between the *threat severity level* and *level of protection*. If no bomb tactic involved, then *threat severity* would be None to Negligible with

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a resultant *level of protection* normally being considered Minimum. See Table AP3.T2.

Tactic	Level of Protection	Potential Structure Damage	Potential Injury	Check Box
Bombing tactics	Minimum	Significant damage, no progressive collapse	Majority (85%) of personnel suffer serious injuries. Likely to be limited number of fatalities (15%).	
	Low	Damaged - unrepairable. No collapse, but structural members require replacement.	Majority of personnel suffer lacerations and blunt trauma injuries from window glazing & non-structural elements	
	Medium	Damaged - repairable. Damaged structural elements can be repaired.	Mostly minor & some serious lacerations & blunt trauma from window glazing & non-structural elements	
	High	Superficial damage	Only superficial lacerations & blunt trauma from non-structural elements.	
Ballistics tactic	Low	Limited - screening	Unlikely	
	High	Superficial - hardened.	None	

G. Questionnaire Sign Off

Signature, Prepared by and Position	Date

NOTE: Security Manager for Navy Projects and PMO for Marine Corps projects sign off and date this form.

Signature, Activity Commanding OfDate	Date

NOTE: Commanding Officer, Executive Officer, or Chief of Staff for Navy and Marine Corps projects sign off and date this form..

United States Marine Corps

Standards
For

Telephone Switching Systems, Inside Plant (ISP) Installation, Outside Plant (OSP) Installation

1. TELEPHONE SWITCHING SYSTEMS STANDARDS

1.1. Government owned system.
1.2. Digital operation.
1.3. Integrated Services Digital Network (ISDN), with both Basic Rate Interface (BRI) and Primary Rate Interface (PRI).
1.4. Initial installation wired to support 125% of single line requirements.
1.5. Traffic Management System (TMS) interface to the KNR system with network interface.
1.6. Vendor recommended software load.
1.7. Vendor recommended processor configuration.
1.8. Voice Mail.
1.9. E911 Services.
1.10. Configured for 7-digit, on-base dialing.
1.11. Use the standard DSN access codes (i.e. – 94, 93, 92, 91).
1.12. Use the number “99” for commercial access code.

2. OUTSIDE PLANT (OSP) INSTALLATION STANDARDS

2.1. Provide single-mode fiber, with a minimum of 12 strands, from the Area Distribution Node (ADN)/Switch Node (SN) to command essential buildings (battalion level and higher.)
2.2. During initial installation, provide copper cable to command essential buildings to support the Single Line Concept and allow for 25% growth.
2.3. Eliminate all lead or paper insulated cables to command essential buildings.
2.4. Provide a minimum of 25 cable pairs for the dedicated plant (Main Distribution Frame to command essential buildings).
2.5. During initial installation of all outside copper cable plant (from host or ADN/SN), allow for 25% growth.
2.6. Include a requirement for single-mode (minimum 12 strands) fiber with all new copper cable installations for command essential buildings.
2.7. For all new copper cable, install cable with PE-39 type (plastic) insulation.
2.8. For all new fiber optic cable, install cable with water-block type insulation.
2.9. New fiber optic or copper distribution cable shall not be installed to any non-appropriated funding activity (e.g., MWR, PX, etc.) unless reimbursement authorization is obtained first.
2.10. No new fiber optic or copper distribution cable shall be installed to any barracks, BOQ, BEQ, or quarters.

3. INSIDE PLANT (ISP) INSTALLATION STANDARDS

3.1. Install all new cable per TIA/EIA standards.

3.2. For voice service, install new copper cable, Category 5, from the Main Distribution Frame to the telecommunications closet(s).

3.3. For data service, install new fiber optic (single-mode or multi-mode depending on distances and economics) cable from the Main Distribution Frame to the telecommunications closet(s).

3.4. Leave existing voice cable (from the telecommunications closet(s) to the Desktop) in place if one of the following requirements is met:

3.4.1. The cable is tested and it passes Category 5 certification.

3.4.2. The cable capacity is sufficient for future voice needs.

3.5. For voice cable addressed in paragraph 3.4 that does not meet either of the requirements outlined, replace the cable with new Category 5 cable. (*Note: A single Category 5 cable is defined as 4-pair/8 conductor.*)

3.6. Telecommunication outlet density per room is shall not exceed the ANSI/EIA/TIA 569A Standard as shown below:

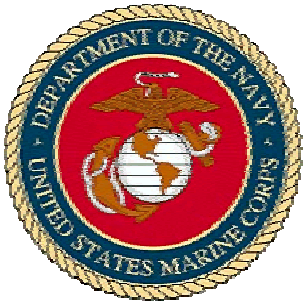
3.6.1. A minimum of one outlet shall be installed per device. For planning purposes, space allocated per workstation averages 10 m2 (100 ft2). For building areas where it is difficult to add telecommunications outlets at a later date (e.g., private office space), a minimum of two separate outlets shall be provided. The outlets shall be located to offer maximum flexibility for change within the work area, e.g., on opposing walls in private office space.

3.7. New cable installation from the telecommunications closet to the rooms (outlets) shall conform to either of the two standards as shown in 3.7.1 and 3.7.2; depending upon distances, economics, and data speed requirements.

3.7.1. STANDARD 1 (Two Cables): If existing voice cable remains per paragraph 3.4 criteria, install one (1) multi-mode fiber optic cable (termed a 1x2 fiber, meaning 1 fiber with 2 strands) and one (1) Category 5 cable to each outlet. Fiber optic cable will be used for data only while the copper may be used for voice or data.

3.7.2. STANDARD 2 (Three Cables): If existing voice cable requires replacement per paragraph 3.4 criteria, install one (1) multi-mode fiber optic cable and two (2) Category 5 cable to each outlet. Fiber optic cable will be used for data only while the copper may be used for voice or data.

3.8. No new cable will be installed in any barracks, BOQ, BEQ, or quarters.



United States Marine Corps

Standards
For

Base Area Networks

1. ARCHITECTURE

1.1. Backbone

1.1.1. All Base Area Network backbones must be interconnected via a minimum of OC-12c links.

1.1.2. The network architecture at each base must be a meshed configuration with no more than 4 major nodes.

1.1.3. If circumstances dictate the need for a large number of backbone nodes, the nodes will be classified as major and minor nodes.

1.1.3.1. Major nodes must be fully meshed.

1.1.3.2. Only two node connections are allowed for non-mesh network architectures. One connection will be to the DCO and the other connections to the local Network Operations Center (NOC).

1.1.3.3. Minor nodes should have one OC-12c Link back to the core of the network as allowed by the existing fiber optic plant. If there are spare fiber ports, a redundant OC-3c interface will be used.

1.1.4. Based upon the guidelines outlined in the HUBS and SWITCHES (Section 4 below) OC-3c single-mode fiber must be used to connect all buildings with 10 or more users.

1.1.5. 802.1Q 100BaseFX Ethernet will be used for very small user count building up-links on single or multi-mode fiber.

1.1.6. Telecommunications closets containing backbone equipment must be climate controlled.

1.1.7. Telecommunications closets containing backbone equipment must have restricted access.

1.1.8. Telecommunications closets containing backbone equipment must have at least two 120VAC circuits wired to different legs in the breaker panel. Additional circuits must be added in pairs.

1.2. Edge

1.2.1. Climate controlled telecommunications closets are not required. For special circumstances, contact the MARCORSYSCOM Base Telecommunications Infrastructure Upgrades project officer for guidance before the installation of climate control equipment.

1.2.2. All telecommunications closets must contain at least one 120 VAC power circuit.

1.2.3. Equipment enclosures must be used when there is no telecommunications closet.

1.2.4. Use nineteen-inch (19”) floor or wall racks.

1.3. Integration of Legacy Ethernet Equipment

1.3.1. In cases where legacy equipment cannot be removed because there is no structured wiring, an edge device with an up-link must be installed.
1.3.2. In cases where legacy equipment is in a building containing thin-net and no structured wiring is planned, the thin-net chains must be broken down into smaller lengths to reduce the number of users sharing a single segment of media.
1.3.3. Media converters must be installed in strategic locations in the thin-net segment where there may be a UTP drop.
1.3.4. The media converter must have a UTP 10BaseT port on one side and a 10Base2 port on the other.
1.3.5. In cases where legacy equipment is in a building containing structured wiring, optical interfaces for the existing equipment must be obtained or used with an external optical media converter.

1.4. Electronics In Buildings Not Serving a Direct USMC Function (e.g., hospital, PX, etc.)

1.4.1. The Base Area Network must provide at least one OC-3c port for connectivity for each type building.
1.4.2. Users in these type buildings must provide for their own equipment and any necessary outside plant work to connect to the backbone.
1.4.3. The Base Area Network manager approves all equipment and software functional specifications/interconnections to the Base Area Network.

1.5. Grounding

1.5.1. All installations must be grounded in accordance with the National Electrical Code.

2. ATM (ASYNCHRONOUS TRANSFER MODE) EQUIPMENT

2.1. ATM Gateway Switch Functional Requirements

2.1.1. Throughput must equal or exceed 2.5 gigabits per second. Availability must equal or exceed 99.997%.
2.1.2. Supports Private Network-to-Network Interface (PNNI).
2.1.3. Demonstrated ability to support a minimum of 3 PNNI Pier Groups.
2.1.4. Supports User-to-Network Interface (UNI), Ver. 3.1 or later.
2.1.5. Supports Interim Local Management Interface (ILMI).
2.1.6. Supports Interim Inter-Switch Protocol (IISP).

2.1.7. Must have an element manager that interfaces to the current Marine Corps standard network packages.
2.1.8. Supports Switched Virtual Circuits (SVCs) and Permanent Virtual Circuits (PVCs).
2.1.9. Multicast capable.
2.1.10. Supports in-band Simple Network Management Protocol (SNMP).
2.1.11. LAN Emulation (LANE) compliant.
2.1.12. Connects to existing USMC electronics such as the DISA POP and currently deployed Base Area Network electronics.
2.1.13. Contains hot swappable components.
2.1.14. Contains redundant controllers and power supplies.
2.1.15. Provides OC-3c interfaces in single and multi-mode optical fiber.
2.1.16. Multi-protocol over ATM (MPOA) compliant.
2.1.17. At a minimum, the product must support Remote Monitoring (RMON) Level - 1. RMON - 2 is desired.

2.2. ATM Backbone Switch Functional Requirements

2.2.1. Supports tandem switching.
2.2.2. Throughput must equal or exceed 10 gigabits per second.
2.2.3. Availability must equal or exceed 99.997%.
2.2.4. Supports PNNI.
2.2.5. Demonstrated ability to support at minimum of 3 PNNI Pier Groups.
2.2.6. Supports UNI, Ver. 3.1 or later.
2.2.7. Supports ILMI.
2.2.8. Supports IISP.
2.2.9. Supports B-ISDN Inter-Carrier Interface (BICI).
2.2.10. Supports SVCs and PVCs.
2.2.11. LANE compliant.
2.2.12. Supports in-band SNMP.
2.2.13. Provides stratum 3 or 4 timing.
2.2.14. Contains hot swappable components.
2.2.15. Contains redundant controllers and power supplies.
2.2.16. Supports OC-12c with plans for OC-48c on larger core switches.
2.2.17. MPOA compliant.
2.2.18. At a minimum, the product must support RMON Level - 1. RMON – 2 is desired.

3. ROUTERS

3.1. Base Area Network Router Functional Requirements

3.1.1. Supports an ATM port adapter interface at an OC-3c data rate with an OC-12c adapter planned.
3.1.2. Provides a T-1 link and circuit emulation card capability.
3.1.3. An MPOA/MPLS server should be available or planned for release within the next 6 months.
3.1.4. Must support TCP/IP.
3.1.5. Optional protocol support for SNA and Banyan Vines as determined by the buyer.
3.1.6. Provides expandable buffer memory.
3.1.7. At a minimum, the product must support (RMON) Level - 1. RMON – 2 is desired.
3.1.8. Supports in-band SNMP.

3.2. Remote Router Requirements

3.2.1. Supports an optional integrated Channel Service Unit/Digital (or Data) Service Unit (CSU/DSU), or T-1 interface.
3.2.2. Must support TCP/IP.
3.2.3. Optional protocol support for SNA and Banyan Vines.
3.2.4. Provides expandable buffer memory.
3.2.5. At a minimum, the product supports RMON Level – 1. RMON – 2 is desired.
3.2.6. Supports in-band SNMP.

4. HUBS AND SWITCHES

4.1. Buildings With Less Than 3 Users

4.1.1. Use a media converter device to provide access for users.
4.1.2. Provide a circuit tear down when a link is lost so all sides can see loss of carrier.
4.1.3. Supports in-band SNMP.
4.1.4. At a minimum, the product must support RMON Level – 1. RMON – 2 is desired.

4.2. Buildings With 3 to 9 Users

4.2.1. Provide network access for 3 to 9 users by installing a small (cost-effective) 10/100 fast Ethernet switch. Capabilities such as CAD, VTC, C2, and other special

circumstances may require an ATM up-link. Exceptions will be made on a case-by-case basis.

4.2.2. Provide 802.IQ/P trunking of VLANs over a common trunk. This allows for membership in multiple VLANs over a single trunk.

4.2.3. The product must have multi-mode and single-mode capabilities.

4.2.4. The product element manager must be capable of running under and interoperating with Marine Corps standard network management packages.

4.2.5. Supports in-band SNMP.

4.2.6. At a minimum, the product must support RMON Level – 1. RMON – 2 is desired.

4.3. Buildings Containing 10 to 30 Users

4.3.1. Provide 10 to 30 users network access by using a "single box" type device.

4.3.2. In addition to the requirements in Section 4.2.2 through 4.2.6, the following capabilities are also required:

4.3.2.1. Must have a single-mode ATM up-link capability.

4.3.2.2. Support for 802.1Q/P VLAN trunking on some ports must be available. These ports will be for use inside the building.

4.3.2.3. LANE compliant.

4.3.2.4. MPOA client compliant.

4.3.2.5. UNI 3.1 compliant.

4.4. Buildings With More Than 30 Users

4.4.1. Users are to be served with a "Chassis" type device.

4.4.2. In addition to requirements in Section 4.3 the following capabilities are also required: (*Note: Backplane speed requirements will be determined through computation analysis.)*

4.4.2.1. Redundant power supplies.

4.4.2.2. Hot swappable component(s).

4.4.2.3. High-density ports and single, multi-mode optical port blades/cards.

4.4.2.4. Single and multi-mode OC-3c and OC-12c ATM up-links.

4.4.3. In some instances, front accessible power supplies and other components may be required.

5. SPARES (*Note: The need for a spare component must be based upon the number of users impacted by a component failure.)*

5.1. Edge Equipment Spares (*Note: Recommendations will impact many users or buildings.)*

5.1.1. Power supplies (if a non-redundant power supply device).
5.1.2. Up-link circuitry.
5.1.3. Interface modules that contain the up-link optics.
5.1.4. Switching fabrics (if non-redundant).
5.1.5. Management processing interfaces (if non-redundant).
5.1.6. Chassis for critical locations. (*Note: Chassis, rather than backplanes, are recommended for sparing since the cost of a chassis is almost equal to the cost of the backplane.)*

5.2. Backbone Equipment Spares

5.2.1. One of each of the various types of optical port up-link components deployed in the network.
5.2.2. Switch fabrics (if non-redundant).
5.2.3. Switch management processing interfaces (if non-redundant).
5.2.4. Power supplies (if a non-redundant power supply device).

5.3. Router Spares

5.3.1. One of each of the various types of ports in use on the router.
5.3.2. Router management processing interfaces (if-non redundant).
5.3.3. Power supplies (if a non-redundant power supply device).
5.3.4. One spare “single box” type router for every 10 installed.